Knik Arm Crossing

Engineering Feasibility and Cost Estimate Update

State Project No. 56047

Volume 1
Issues and Corridor Alignment

Prepared for:
Alaska Department of Transportation and Public Facilities

Prepared by:
Parsons Brinckerhoff
HDR Alaska, Inc.

In affiliation with:
Lounsbury, Inc.
Word Wrangling, Inc.

January 31, 2003

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1.0 INTRODUCTION

The Alaska Department of Transportation and Public Facilities (ADOT&PF) prepared the Knik Arm Crossing Draft Environmental Impact Statement (DEIS) in 1984 to evaluate alternative transportation modes and alignment locations for crossing the Knik Arm from Anchorage to the Matanuska-Susitna (Mat-Su) Borough. The 1984 DEIS and supporting reports are the last comprehensive study documents prepared for a Knik Arm Crossing project. Two viable corridor alignments were identified in the DEIS—the Downtown Anchorage/Houston Alternative and the Elmendorf Air Force Base (AFB)/Houston Alternative—and were subsequently evaluated for detailed cost and impact comparisons.

The objective of this Knik Arm Crossing Engineering Feasibility and Cost Estimate Update Project (Update Project) is to provide a preliminary examination of historical and current planning, engineering, and cost factors for the purpose of updating the engineering feasibility and cost estimate components of the project. The Update Project reviews the two viable build alternatives from the Knik Arm Crossing 1984 DEIS and identifies new engineering and construction technology in order to establish an up-to-date opinion of project costs. The Update Project also examines changes, from 1984 to 2002, in land use, transportation planning, and environmental regulations to determine whether the two DEIS build alternatives, Downtown Anchorage/Houston and Elmendorf AFB/Houston, continue to represent viable build alternatives for the project. The update of costs resulting from this evaluation will provide a current probable range of project costs for viable build alternatives based on capital costs and risk-based contingency. Additionally, the update evaluation addresses short- and long-term build scenarios for a Knik Arm Crossing project.

The Update Project presents basic data, cost estimates, financing considerations, and timetables for future project phases and is not intended to restudy all options or identify a preferred alternative, which will be done in future EIS work efforts. This memorandum presents a basic understanding of the challenges and complexities that have and will occur as part of the decision making process for a Knik Arm Crossing project. In order to prepare updated budgetary and project work programming cost estimates for future project phases, historic project studies were reviewed and literature research assessments were conducted to "book-end" a general alignment for use in evaluating planning level cost estimates that would represent approximate funding needs for a Knik Arm Crossing project. The representative alignment, for cost estimating purposes only, is identified as the Hybrid Alignment.

The benchmark for historic report data for the purposes of this Update Project is the 1984 DEIS and "Implementation Options" (Volumes 1 and 2) issued on February 28, 1985, as a follow-up to the DEIS. The conclusions drawn from the 1984 DEIS and supporting documents regarding general alignment locations form a good basis for this preliminary update and reevaluation of alignment alternatives for a Knik Arm Crossing project.

In this technical memorandum, project issues, land use changes, alignment issues, and corridor-level traffic conditions are summarized and discussed, concluding with the identification of a representative alignment (Hybrid Alignment) for cost estimating purposes only. In many cases, project conditions and issues remain the same as they have for the past several decades.

2.0 PROJECT ISSUES

The following discussion of project issues identifies and updates the predominant "big-picture" project issues associated with implementation of a Knik Arm Crossing project. A limited literature search and review was conducted of both the previous Knik Arm Crossing project documentation and updated information that might affect a Knik Arm Crossing project.

Generally, project issues can be grouped into five broad categories:

- Purpose and need/project rationale
- Stakeholder, agency, and public support/comment
- Project location and impacts
- Costs
- Economic feasibility, financing, and implementation

The following discussion of project issues examines these five categories in the context of (1) the benchmark for historic data—the 1984 DEIS and "Implementation Options" (Volumes 1 and 2) (1985), and (2) updated/current project issues assessment of changes that have occurred since preparation of the 1984-1985 comprehensive Knik Arm Crossing study documents.

2.1 Historic Project Issues

The long history of studies already performed for a Knik Arm Crossing provides good insight into the project issues associated with planning, implementation, and construction of the project. Following is a brief list of the primary historic documents and studies that led up to the 1984 DEIS.

- In 1955, the Anchorage Chamber of Commerce commissioned an economic study for a crossing of Knik Arm at Cairn Point. The study report stressed the military defense benefits of such a crossing.

- In 1972, the State of Alaska Department of Highways completed the "Knik Arm Highway Crossing Study" for the express purpose of exploring the technical and engineering problems associated with a structure across Knik Arm.

- In 1975, a "Phase I Feasibility Study for a Proposed Knik Arm Crossing Utilizing a Ferry System" was commissioned by the Alaska Department of Public Works. This study recommended a ferry crossing location generally at Cairn Point, with an access road between Elmendorf AFB and Fort Richardson.

- A second economic feasibility report prepared in April 1983 by the ADOT&PF concluded that the Knik Arm Crossing and approach roads would be an economically feasible project under even the most conservative assumptions. Quantifiable Knik Arm Crossing benefits were estimated to exceed costs for discount rates (cost of borrowing money) up to 12 percent. Subsequent sensitivity tests concluded that even a substantial reduction in forecast crossing traffic and travel benefits (aside from economic development benefits) still would yield a positive benefit-cost ratio for a discount rate of

six percent. The economic analyses indicated that the Knik Arm Crossing project compared favorably with other state transportation and infrastructure investments.

2.1.1 Historic Purpose and Need/Project Rationale Issues

The purpose and need for the project provides the fundamental "issues" basis for the project.

The purpose of the Knik Arm Crossing project as stated in the 1984 DEIS was as follows:

- To bring additional developable land within proximity to Anchorage.
- To enhance port and industrial development opportunities in the Mat-Su Borough.
- To increase accessibility between Anchorage and communities to the north.
- To improve the efficiency of motor vehicle operations between Anchorage and areas to the north**.**

The need for the project was based on the following:

- Need for developable land
- Industrial development opportunities
- Increased accessibility
- Efficiency of motor vehicle operations

In addition to improved transportation efficiency and serving to divert travel demand and avoid alternative roadway network improvements, the Knik Arm Crossing project clearly had a broad economic and development focus as its basis. The Crossing has always been based on a vision of the future and strategic long-term transportation and land use planning. Purpose and need issues have been of the magnitude to have significant regional and statewide benefit and impact ramifications. The issues that arise out of the purpose and need are, therefore, more complex, more variable, and somewhat less quantifiable.

2.1.2 Historic Stakeholder, Agency, and Public Support/Comment Issues

Key stakeholders involved in historic studies relating to the Knik Arm Crossing project have included the ADOT&PF, Alaska Railroad Corporation (ARRC), Municipality of Anchorage (MOA)/Port of Anchorage (POA), Mat-Su Borough (Port MacKenzie did not exist in 1984), City of Houston, City of Wasilla, community of Big Lake, Elmendorf AFB, Fort Richardson Army Post, and the general public. The proposed Crossing project potentially affected virtually all modes of transportation, regional economies, and regional land uses in the area.

As part of the 1984 DEIS, extensive scoping and public involvement programs were conducted. Throughout the project, public meetings were held to obtain input from the community. In addition, extensive coordination was conducted with stakeholders and agencies. Three public hearings were held on the DEIS: in Anchorage on October 3, 1984; Wasilla on October 4, 1984; and Houston on October 9, 1984. According to the "Implementation Options, Volume 1," public hearing review comments on the DEIS ran heavily against the Downtown Project, and minimal opposition was expressed regarding the Elmendorf Project. Individual comments ran the full spectrum from support for the project to opposition due to impacts, perceived lack of project need, and financing issues.

Areas of controversy identified in the 1984 DEIS included the following:

- Changes in growth patterns in Anchorage and the Mat-Su Borough that would result from a Crossing and whether or not they would be of benefit to the two communities.
- Fiscal impact to the Municipality of Anchorage and the Mat-Su Borough from the change in future growth patterns resulting from a Crossing
- Competition for state general revenue funds or federal participating highway funds and whether or not there are other uses for those funds that are of higher priority.
- With a Downtown Crossing, the potential for ship collision with the bridge was an area of concern for ship and barge operators.
- The effect of the crossing alternatives under consideration on traffic operation in and around downtown Anchorage.

2.1.3 Historic Project Location and Impact Issues

The 1972 "Knik Arm Highway Crossing Study" indicated that a bridge crossing located approximately 8,000 feet upstream of Cairn Point was the most favorable location and type of highway structure across Knik Arm. This crossing location is shown in **Figure 2.1** *(Previous ADOT & PF Project Alignments)*. Roadway connections and comprehensive impact analysis were not a part of this study.

In the 1984 DEIS, two Bridge Crossing and three No-Bridge Crossing Alternatives were included in the final evaluations. The Bridge Crossing alternatives were identified as the Downtown Project and the Elmendorf Project, as shown in **Figure 2.1** and **Figure 2.1-A** *(Previous ADOT&PF Project Alignments—Downtown Anchorage Detail)*. The No-Bridge Crossing alternatives included No-Action, Glenn/Parks Improvement, and Hovercraft. Alternative bridge locations, tunnel, and causeway configurations and a tidal power alternative were discarded for reasons of high cost, low benefit, aviation encroachment, and environmental damage.

Overall project issues identified in the 1984 DEIS included impacts on the following:

- Traffic volumes and flow
- Growth and economic development
- Social and socioeconomic impacts
- Urban and military function and operation
- Biological resources and wetlands
- Air quality
- Section 4(f) resources

In addition, as part of the "Implementation Options" analyses, additional consideration was given to a southerly approach route to the Elmendorf Crossing below the bluff near Cairn Point, east of the Port of Anchorage and Government Hill (below-grade roadway through a portion of the Government Hill neighborhood), and connecting with the intersection of the Seward and Glenn Highways. This alternative route, called the Bluff Project, was originally considered during the 1984 DEIS Corridor Alternatives Analysis phase, but was rejected because it would penetrate the clear zone around the Circularly Disposed Antenna Array (CDAA) at Elmendorf AFB. The Bluff Project alignment is shown in **Figure 2.1** and **Figure 2.1-A**.

2.1.4 Historic Cost Issues

In the 1972 "Knik Arm Highway Crossing Study," the recommended crossing structure was a truss span bridge that had an estimated construction cost of $126 million (M) and a total project cost of $140 M, including contractor contingencies, subsurface testing, surveys, test structures, model testing, engineering, and administration (1972 dollars). The report also noted that considerable cost could be added to the project if soil borings indicated the need for extensive slope protection along the bluffs of Knik Arm. Roadway connections and comprehensive impact analysis were not part of this study.

Updated project cost estimates for the Downtown and Elmendorf Crossing Alternatives featuring a four-lane bridge as reported in the "Implementation Options, Volume 1, 1985" were $1,107 M and $698 M, respectively (1985 dollars). These costs were higher than those presented in the 1984 DEIS because they reflected the results of a preliminary geotechnical boring program in Knik Arm during the summer of 1984. Foundation materials, particularly in the path of the Downtown Crossing, proved less favorable to bridge construction than earlier anticipated, which raised serious questions of feasibility for the Downtown Crossing. The 60 percent higher cost of the Downtown Project appeared unlikely to generate proportionately higher benefit, according to the report.

In the 1985 "Implementation Options" report, the total project cost of the Bluff Project was estimated at approximately $648 M (1985 dollars).

2.1.5 Historic Economic Feasibility, Financing, and Implementation Issues

Following the 1984 DEIS, the ADOT&PF prepared two reports entitled "Implementation Options, Volume 1 and Volume 2" (February 28, 1985), that presented the design, financial, and development/management options for implementing a Knik Arm Crossing and included a strategy for moving the project toward construction. A phased Elmendorf Crossing with a Houston Connector was reported to be "the most promising project" at the time. Information was presented to allow decision makers to address interrelated policy issues and questions concerning the following:

- Project rationale:
  - Is a highway crossing of Knik Arm an appropriate addition to the State highway system, given regional development objectives, forecast demand, and financial constraints?
- Crossing location and design concept:
  - Are the proposed Crossing location, design concept, and construction phasing appropriate?
- Cost:
  - Should State commitment to a Crossing be deferred subject to resolving cost uncertainties (i.e., right-of-way through Elmendorf AFB and bridge foundation requirements)?
- Finance:
  - How much of the project cost should be borne by bridge users and property owners directly benefited by a Crossing?
  - How much State funding is appropriate? Over what period of time? Under what

conditions (i.e., loan or grant)?

- Administration and management:
  - How should State and local consensus be obtained prior to implementation?
  - How should periodic legislative oversight and approval be incorporated in project development to minimize State risks?
- Implementation schedule:
  - Does the proposed implementation schedule appropriately reflect project need and State ability to pay?
  - Does the schedule complement the phasing of other roadways and capital improvements in the region?
  - Should project development be continued in Fiscal Year 1986?

A Knik Arm Crossing was envisioned to have two principal economic benefits: transportation time/cost savings and increased value of land, including enhanced opportunities for port and industrial development in the Mat-Su Borough. In order to minimize use of government funds, bridge tolls and assessment of property that the Crossing directly benefited were proposed as principal funding sources for a Knik Arm Crossing.

To provide for overall administration of construction, operation, and maintenance of a Knik Arm Crossing, Joint Powers Agreements (JPAs) were envisioned between the State of Alaska, Mat-Su Borough, and the Municipality of Anchorage to address all matters necessary to ensure orderly completion of the project and maximization of regional benefits. The Implementation Schedule suggested a project development strategy of JPAs, regional transportation and land use planning, Final EIS completion, detailed geotechnical investigations, and design studies from 1985 to 1988. Upon Legislative approval in 1988, final design, right-of-way acquisition, and construction permit applications would begin. Construction contracts were envisioned to be awarded in 1989, and the bridge was anticipated to be open to traffic in 1994.

An important part of financing strategy for the Knik Arm Crossing was to minimize initial costs by constructing the project in phases. Travel forecasts at the time indicated that a two-lane bridge would be adequate until the 2004 to 2020 timeframe, depending on the rate of land development, toll rate, and extent of a connector road system. Also, it was concluded that the entire Houston Connector should be built because a connection to the Parks Highway was necessary to attract the most bridge traffic, have the greatest toll revenue, and require the least State appropriations.

Additionally, in association with the 1984 DEIS, an economic feasibility study was conducted to evaluate a railroad crossing across Knik Arm. The report, entitled "Knik Arm Railroad Crossing Feasibility Study" (July 1984), analyzed seven alternatives. On the basis of the forecast costs and benefits, it was concluded that a railroad crossing should not be built until some time after 2025, and a railroad crossing should not be built as part of the Knik Arm Highway Crossing. The report concluded that it was unlikely that results would change with the use of different assumptions, within a reasonable range, regarding traffic growth, construction costs, railroad operation and maintenance costs, or crossing locations. The analysis indicated that if the railroad crossing and northern extension became economically feasible after 2025, then the crossing should be a separate railroad-only crossing, and the Knik Arm Highway Crossing should not be

designed to accommodate the later addition of railroad facilities. The analysis also indicated that, if a crossing became feasible in the future, Eagle River would be the preferred location. ARRC personnel commented that the Downtown Crossing may be preferable for railroad operational reasons. The report concluded that it was reasonable to defer consideration of a specific location to a later time.

2.2 Updated Project Issues

Since completion of the 1984 DEIS and "Implementation Options" (Volumes 1 and 2) (1985) reports, numerous transportation studies, public meetings, and construction projects have occurred that have built upon the project issues platform described above or are potentially related to segments of a Knik Arm Crossing project.

Following are updates to the five broad categories of historic project issues.

2.2.1 Updated Purpose and Need/Project Rationale Issues

Because comprehensive studies of a Knik Arm Crossing have not been undertaken since the 1984 DEIS and associated documentation, no formal purpose and need documentation is available for project update consideration. New land uses and construction projects have occurred, however, that support the concept of a Knik Arm Crossing and historic purpose and need objectives.

One key development has been construction of Port MacKenzie and the Point MacKenzie Access Road. Detailed information regarding this development, in addition to other land use plans and development master plans relating to purpose and need issues, is discussed in Chapter 3, Corridor Land Use Changes.

Overall, most of the historic purpose and need statements still remain valid today. The updated purpose and needs are as follows:

- The need for additional developable land outside of the Anchorage Bowl, particularly industrial land
- The need to improve freight and goods movement
- The need to support port and rail development
- The need to improve transportation efficiency

2.2.2 Updated Stakeholder, Agency, and Public Support/Comment Issues

Numerous public meetings and discussion forums have taken place since the 1984 DEIS. Due to the limited scope of this technical memorandum, not all of these public meetings have been inventoried to assist in the identification of key project issues. However, two recent Knik Arm Crossing meetings provide good insight into some of the current thoughts on stakeholder, agency, and public support or comment on a Knik Arm Crossing project. Summaries of these two meetings are provided below.

October 16, 2001, Public Hearing

Senator John Cowdery, Transportation Committee Chairman, sponsored a public hearing on the Knik Arm Crossing project in Anchorage on October 16, 2001. Public testimony was generally in support of further developing the project. Key project issues included the following:

- Need for developable lands outside of Anchorage, especially industrial lands
- Economic development incentives provided with a Crossing
- Enhanced recreational access provided with a Crossing
- Shortened travel times and more efficient freight and goods movement with a Crossing
- Expansion opportunities for the Ted Stevens Anchorage International Airport (TSAIA) on the Mat-Su Borough side with a Crossing
- Need to study all modes of transportation and uses for a Crossing
- Need for intergovernmental coordination and support for the project
- Need to move project forward now
- Impact of funding a Crossing on Alaska's transportation budget
- Concern that a Crossing would encourage sprawl
- Utilization of a Crossing—Most Mat-Su Borough trips would use the Glenn Highway.
- Lack of inclusion of a Crossing in the Anchorage 2020 Comprehensive Plan
- Maintenance and operation budget implications with a Crossing

May 16, 2002, Public Meeting

The International Right-Of-Way Association (IRWA) hosted a seminar on May 16, 2002, to discuss a Knik Arm Crossing project. Abbreviated meeting notes include the identification of the following project issues:

- Need to cut through the red tape and move on with the project-time is now
- Need to focus on a Crossing as a regional project-need to think big and long term
- Serious but manageable issues related to a Crossing -deserve priority consideration
- Project location options, bridge type, and costs
- Port of Anchorage and Port MacKenzie expansion issues
- Soils and geotechnical issues
- Military security and Electromagnetic Compatibility (EMC) issues at Elmendorf AFB and Fort Richardson
- Current project needs are related to traffic growth, industrial land shortage, TSAIA growth and noise issues, Mat-Su Borough growth, residential densities, and current congressional horsepower
- Need for a regional transportation and land use plan—long-term vision
- Need to evaluate future transportation and land use needs with and without a Crossing
- Intergovernmental conflict on what needs to be done
- Natural system and wetland impact issues
- Socioeconomic issues
- Financing issues

2.2.3 Updated Project Location and Impact Issues

The list below identifies some key area-wide transportation studies and projects that potentially relate directly to some aspect of a Knik Arm Crossing corridor, including those conducted by the military, Mat-Su Borough, Municipality of Anchorage, Alaska Railroad Corporation, and the Port of Anchorage. More localized transportation and multimodal improvement studies, such as those being considered by ARRC and the POA, are discussed in Chapter 3, Corridor Land Use Changes. A detailed discussion of these updated alignment studies and impact issues is contained in Chapter 4, Alignment Issues Update.

- "Corridor Analysis for the Proposed Knik Arm Crossing, Elmendorf AFB/Fort Richardson, Final Report" (February 4, 1986)
- "Point MacKenzie Transportation Corridor Study," March 2, 1992
- Mat-Su Rail and Highway Corridor Study, 2002 (currently in progress)
- Ferry Crossing Project from the Mat-Su Borough to Anchorage, 2002 (currently in progress)
- "Ship Creek/Port Access—Ingra/Gambell Alternative—Feasibility Study," 1999
- "Ship Creek Multi-Modal Transportation Plan," December 2000
- "North Access Corridor Reconnaissance Study," October 1999
- "Ship Creek Development Master Plan," March 1999

On the basis of the alignment discussion in Chapter 4, two general south approach locations should still likely be considered in a future EIS. The Downtown and Elmendorf AFB/Fort Richardson alternative should be reevaluated as viable options since each has distinct advantages and disadvantages. Evaluation of the Downtown Crossing should consider updated alignment evaluations with components from the 1985 ADOT&PF Bluff Project and the 1999-2000 MOA/POA Anchorage and Ship Creek transportation alignment studies. The evaluation of the Elmendorf AFB and/or Fort Richardson Crossing should consider the 1986 Department of the Air Force corridor analysis for a Knik Arm Crossing and will require extensive coordination with military staff to determine the current viability of alignment alternatives through military lands. A bridge across Knik Arm should ideally be located north of both the Port of Anchorage and Port MacKenzie to avoid shipping issues and poor geophysical conditions in Knik Arm. Because of these conditions, the most economical crossing location is north of Cairn Point. On the Mat-Su Borough side, current land use development and future land use plans strongly support the previously identified Segment 1 of the Houston Connector. With the exception of expanded residential development near Big Lake that may require alignment modifications, the Segment 2 alignment of the Houston Connector should terminate in the Houston to Willow vicinity. The Willow Corridor evaluated as part of the 1984 DEIS may warrant an update reevaluation to reconsider its viability.

2.2.4 Updated Cost Issues

Military Alignments

In the "Corridor Analysis for the Proposed Knik Arm Crossing, Elmendorf AFB/Fort Richardson, Final Report" (1986), the recommended North-2 Alignment project costs were estimated at $339 M to $354 M (1985 dollars). Project cost estimates included costs for the Elmendorf highway connection, Base impact costs and the Knik Arm Crossing structure. It is not clear whether cost estimates included the north approach (Mat-Su Borough) cost components.

Mat-Su Borough

In the "Point MacKenzie Transportation Corridor Study" (1992), Study Corridor 5 appeared to be the best rail route, with a length of 32 miles from the Port to Milepost (MP) 56.1 on the Parks Highway. The 1992 estimated cost of this rail construction was $44 M. Study Corridor 3 appeared to have the best potential for long-range highway access. This corridor extended from Port MacKenzie to MP 70.8 of the Parks Highway. The 1992 estimated cost of this new two-lane access highway was $40.5 M.

Municipality of Anchorage

- "Ship Creek/Port Access—Ingra/Gambell Alternative—Feasibility Study" (1999); cost estimates for these transportation improvement alternatives ranged from $35 M to $170 M.
- "Ship Creek Multi-Modal Transportation Plan" (December 2000); total project construction cost estimates, including trail, boardwalk, roadway, and transit improvements, were estimated at approximately $108 M.

2.2.5 Updated Economic Feasibility, Financing, and Implementation Issues

Economic feasibility, financing, and implementation studies for a Knik Arm Crossing project have not been extensively studied since the 1984 DEIS and associated documentation. Preliminary updates to the economic feasibility, financing, and implementation of a Crossing project are contained in Volume 3 of this Update Project.

2.2.6 Updated General Project Issues

Numerous and miscellaneous changes that both favorably and negatively affect the various components of a Knik Arm Crossing project have occurred since the 1984 DEIS. Some of the key updates are as follows:

- Land use changes
  - Numerous land use changes and future land use plans have occurred or are under way in the project area, in addition to changes in land use policies. Also, individual land use areas that affected previous alignments, such as the removal of the Native Hospital on 3rd Avenue, are no longer a design constraint. New redevelopment plans, such as those proposed by ARRC at Ship Creek, could be substantially affected

by the previously studied alignment for the Seward Connector. These land use changes, which present both opportunities and constraints, are identified in Chapter 3, Corridor Land Use Changes.

- Transportation changes
  - Primary transportation improvements potentially affecting a Knik Arm Crossing project that have occurred since the 1984 DEIS include port development at Port MacKenzie and port expansion at the POA; lane additions on the Glenn Highway; ARRC track straightening on military lands; a new intermodal center at Ted Stevens Anchorage International Airport; multi-lane improvements on the Parks Highway; current construction of the Glenn-Parks interchange; numerous ongoing multi-modal transportation improvement studies/projects; and the current Parks Highway Corridor Study.

- Environmental/ environmental regulation
  - Many of the environmental regulations that currently exist were in place during the 1984 DEIS process. However, new National Environmental Policy Act (NEPA) studies will need to consider updates to issues such as the Clean Air Act amendments, environmental justice legislation, essential fish habitat, contaminated sites, advanced methodologies for evaluation of noise impacts, protected species list updates, new Section 4(f) resources (parks, refuges, historic/archaeological sites), and community impact assessment guidelines. Specifically, air quality conformity associated with a Knik Arm Crossing project will be especially critical. Anchorage became a non-attainment area for carbon monoxide (CO) in 1996 and a Crossing project has the potential to affect Anchorage's ability to maintain air quality conformity. In October 2002, the State Implementation Plan for Air Quality Conformity was approved, requiring Anchorage to adhere to an emissions budget. Future air quality conformity analysis for the project will have to comply with the established CO emissions budget.

- Transportation legislation and funding
  - With the advent of the Intermodal Surface Transportation Efficiency Act (ISTEA) and the Transportation Equity Act, Section 21 (TEA-21), stronger emphasis has been placed on multi-modalism and inter-modalism, efficient transportation solutions, freight and goods movement, congestion management, transit, and local governmental involvements in transportation.

- Engineering and construction technology
  - Significant advancements have occurred in engineering design, design criteria, seismic analysis procedures, bridge design, tunnel design, and construction techniques. Many of these advancements in engineering are discussed in Volume 2 of this Update Project.

- Alaska state capital
  - Discussions continue about the potential future relocation of the state capital from Juneau to the Mat-Su Borough.

- Military lands
  - With the occurrences of 9/11/01 relating to terrorist actions, stronger emphasis has been placed on national security and the military missions of Elmendorf AFB and Fort Richardson. New security measures may affect some of the previously studied alignment alternatives. In addition, the CDAA is still in operation and presents a substantial design constraint to the project. Alignments and security measures need to be studied in detail before conclusions are drawn, but in general, a heightened military mission for both Elmendorf AFB and Fort Richardson will impose complexities for any alignment alternative in the proximity of these military installations. In addition, Fort Richardson has previously been identified as a candidate for Base closure, a condition that should be monitored in future project phases.

- Ted Stevens Anchorage International Airport (TSAIA) Airport Relocation
  - According to the "Draft TSAIA Master Plan Update" (June 2002), the existing airport is forecast to reach capacity within the next six years and to be about 25 percent over capacity by 2020. The northern approaches to the Knik Arm Crossing need to recognize the Knik Aviation Reserve and allow for future potential development of this site.

2.3 PROJECT ISSUES SUMMARY

In summary, the key project issues identified in the 1984 DEIS included changes in travel patterns and induced growth, adverse effects to the natural and social environment, relocation and right-of-way impacts, and the affects on the military missions of Elmendorf AFB and Fort Richardson Army Base.

The following are updates of these key historic project issues:

- Population and economic growth rates have not equaled 1984 projections.
- Port MacKenzie and access roads are now constructed and operational.
- Assumed roadway networks in the Anchorage Bowl have not occurred.
- A greater understanding of Knik Arm geology is now available.
- New land uses, land use plans, master plans, and land use policies are in place in both Anchorage and the Mat-Su Borough.
- Ship Creek area development has intensified at the POA and the Alaska Railroad, and new projects are in the works.
- Environmental regulations have changed.
- Federal emphasis on multimodal and intermodal transportation solutions has increased.
- Advancements in engineering designs and seismic engineering have occurred.
- The need to expand air cargo operations at TSAIA has increased.
- Heightened military security measures have been implemented since 9/11/01.

The updated understanding of the project issues indicates that many other issues originally identified in 1984 remain largely unchanged. At the same time, new opportunities and constraints exist that warrant reevaluation of previously studied concepts and alignments.

The following subsections present updated lists of project issues, based on the five broad issues categories previously described, that should be addressed and solved in future project phases:

- Purpose and need/project rationale
- Stakeholder, agency and public support/comment
- Project location and impacts
- Costs
- Economic feasibility, financing and implementation

2.3.1 Project Purpose and Need/Project Rationale Issues

- Establishment of a clear definition of project purpose and need objectives
- Verification of validity and credibility of issues that include project objectives, economic development objectives, development needs, resource development opportunities, available lands needs, safety, and transportation efficiency
- Establishment of methodology for predicting travel demand, population, growth estimates, and land use forecasts
- Reevaluation and update of accessibility and mobility issues; for example: How much travel time and cost savings will be realized and what needs should be met? What would a Crossing do for rail times and trucking cost savings?
- Further evaluation of multi-modal and inter-modal considerations
- Determination of how the Knik Arm Crossing project can best tie the existing and future transportation infrastructure network together in Anchorage and the Mat-Su Borough, including the Glenn Highway, Seward Highway, POA, Parks Highway, and the Alaska Railroad
- Determination of how the Knik Arm Crossing can best be developed to serve the Mat-Su Borough, Anchorage, POA, Port MacKenzie, and local communities

2.3.2 Stakeholder, Agency, and Public Support/Comment

- Development of a shared vision of the future: bringing together the community and key stakeholders and consideration of development of a transportation advisory group.
- Reevaluation to identify stakeholder and public needs and objectives
- Addressing cross-jurisdictional and intergovernmental authority issues
- Definition of the effect on transportation funding for other projects if a Crossing is pursued, including impact on competing funds
- Clear communication of the project objectives and identification of values of the communities most directly affected by a Crossing project
- Development of strategy for consensus building among agencies, stakeholders, officials, and public
- Evaluation of how potential changes in land supply and traffic patterns affect the basic premises underlying current land use and long range transportation plans

2.3.3 Project Location and Impacts

- Reevaluation of corridor and project alignment alternatives in direct response to updated project purpose and need objectives

- Determination of how and where the project will connect into Anchorage's existing and future roadway transportation network
- Reevaluation and full update of alignment location issues, including functionality, transportation requirements, project termini, engineering feasibility, accessibility, connections with existing and future transportation systems, and land use service areas
- Reevaluation and full update of geometric issues and design criteria (i.e., bridge/tunnel crossing type, bridge substructure requirements, integrated multi-modal transportation facility, pier protection, lateral loading factors, slope stabilization, and seismic design)
- Further evaluation of design constraints, security issues, and consistency with Elmendorf AFB and Fort Richardson military functions, operations, and missions
- Reevaluation of a Crossing project for consistency with ongoing land use, transportation, development, and master plan studies such as Anchorage 2020 and Mat-Su Borough comprehensive plans, long range transportation plans, the current Parks Highway Corridor Study, the current Mat-Su Rail and Highway Corridor Study, ARRC improvements, port development, and Ship Creek area transportation improvements
- Reevaluation of aviation clear-zone restrictions affecting alignment alternatives
- Reevaluation of shipping and navigational issues, needs, and criteria
- Reevaluation of soils and geotechnical constraints and issues
- Updated constructibility review for alternatives
- Reevaluation and update of changes in traffic and travel patterns and traffic diversions associated with a Crossing project and update of AMATS LRTP; for example: What do conditions look like with and without a Crossing project? How do alignment locations vary these conditions?
- Reevaluation of social and socioeconomic impacts
- Reevaluation of changes in land use patterns and intensity of development, shift in urban growth to the Mat-Su Borough, and effect on current land use plans and development plans
- Revaluation of impacts on and needs for community facilities and services; for example: What burden will construction of a Crossing impose on already existing financial deficiencies in area communities?
- Revaluation of community cohesion issues; community impact assessment
- Reevaluation of community growth and economic development issues; for example: How much population and employment growth will be induced by construction of a Crossing? What effect will construction have on the prevailing wage and price structure, cost of living, the cost of doing business, tourism, and job bases?

The following impact categories will be important project issues in future project development evaluations:

  - Secondary and cumulative impacts
  - Right-of-way impacts; for example: How many businesses, residences, and community service facilities will be affected directly or indirectly by the project? What are the controlled access right-of-way issues?
  - Business impacts; for example: Will changes in travel patterns create financial hardship for local economies?
  - Land use implications and impact on existing infrastructure and infrastructure

needs
- Section 4(f) and Section 6(f) resources (parks, refuges, and historic/archaeological resources) and recreational lands impacts
- Natural resource impacts, especially wetlands, wildlife and habitat, essential fish habitat and fisheries, marine mammals, and water quality
- Cultural resource impacts
- Environmental justice issues
- Subsistence and Native land issues
- Utility impacts
- Air quality impacts and compliance with the State Implementation Plan for Air Quality Conformity
- Noise impacts
- Contamination impacts
- Construction impacts
- Farmland impacts, including the Point MacKenzie Agricultural Area
- Visual impacts and aesthetic and architectural considerations
- Transportation impacts
- Regulatory permittability of a Crossing project

2.3.4 Costs

- Development of a Crossing project whose cost is fundable
- Development of updated and accurate construction cost estimates
- Reevaluation of slope protection cost estimates
- Reevaluation and update of relocation and right-of-way cost estimates.
- Development of mitigation costs.
- Reevaluation and update of operational and maintenance costs
- Reevaluation of life-cycle cost evaluations for viable alternatives

2.3.5 Economic Feasibility, Financing, and Implementation

- Identification of project funding sources, including innovative funding sources
- Reevaluation of major effects on the distribution cost and distribution of goods, services, and passengers
- Definition of local government finance needs and fiscal impacts on local government revenues and local government costs; for example: Will increased land values and tax structure revenues be sufficient to offset direct and indirect project costs?
- Development of an updated financing plan
- Development of an updated strategy for project phasing
- Development of an updated construction schedule
- Development of an updated administration and management plan

Knik Arm Crossing Engineering Feasibility and Cost Estimate Update

Previous ADOT&PF Project Alignments

(From the 1972 "Knik Arm Highway Crossing Study" and the 1984 DEIS.)

Figure 2.1

MATANUSKA - SUSITNA BOROUGH

HOUSTON

BIG BEAVER LAKE

BIG LAKE

WASILLA

PALMER-WASILLA HWY

PARKS HWY

GLENN HWY

IDITAROD TRAIL

SUSITNA RIVER

KNIK ARM

FORT RICHARDSON

Cairn Point

ELMENDORF AIR FORCE BASE

COOK INLET

MUNICIPALITY OF ANCHORAGE

Legend

Alignments

- Downtown I Crossing (1984)
- Bluff Project (1984)
- Elmendorf Crossing (1984)
- Houston Connector Seg. 1 (1984)
- Houston Connector Seg. 2 (1984)
- ADOT&PF Alignment Crossing (1972)
- Trails
- Roads
- Railroad
- City Limits
- Water Bodies, Rivers

Data compiled by HDR Alaska, Inc.
September 2002

Source of data from:
Municipality of Anchorage,
Matanuska-Susitna Borough,
Department of Natural Resources,
USGS

Map is projected to Alaska Stateplane Zone 4, NAD 27.

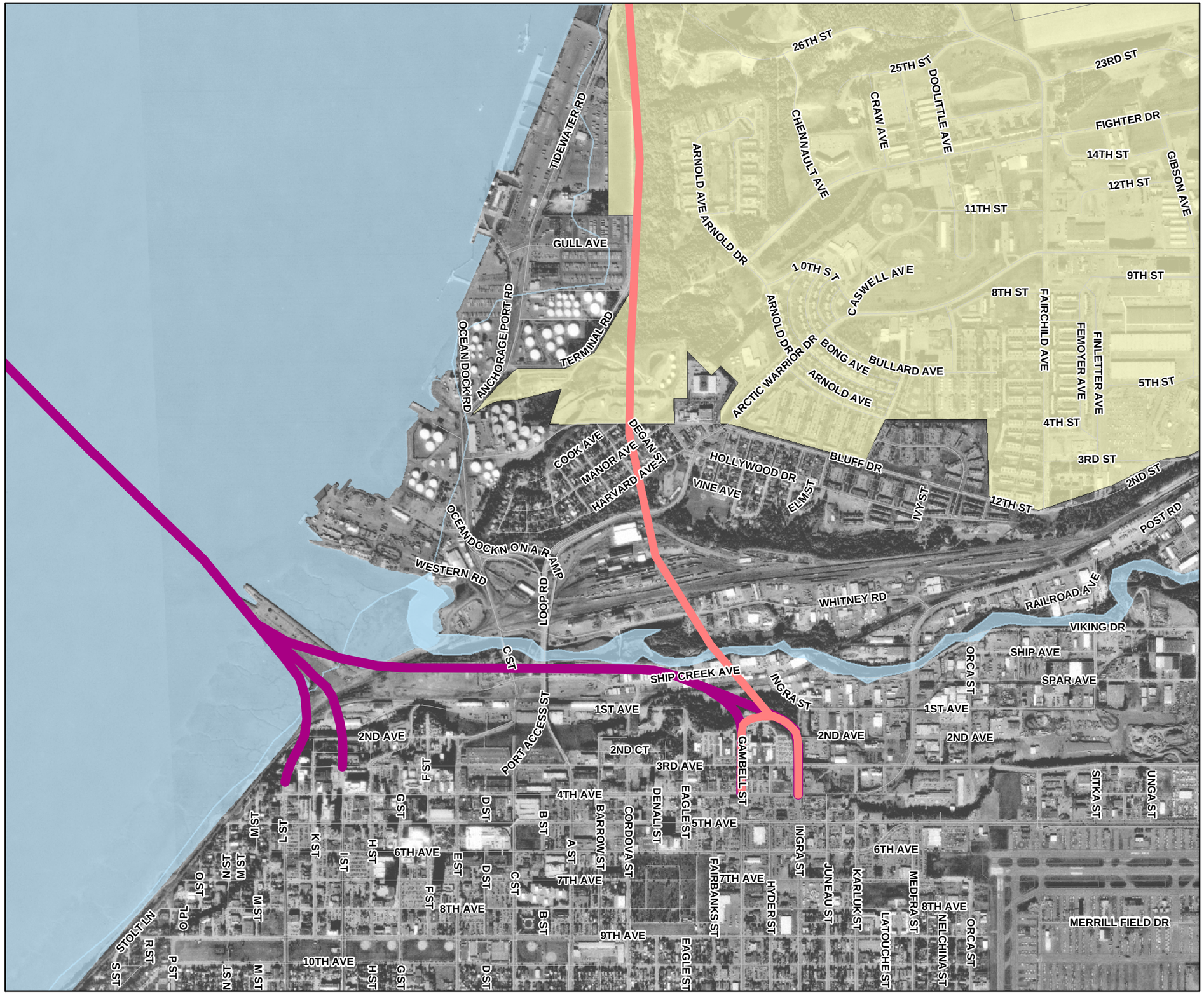
3 1.5 0 3 Miles

Knik Arm Crossing Engineering Feasibility and Cost Estimate Update

Previous ADOT&PF Project Alignments - Downtown Anchorage Detail

(From the 1984 DEIS)

Figure 2.1-A



Legend

Alignments

- Bluff Project (1984)
- Downtown I Crossing (1984)
- Roads
- Elmendorf Air Force Base
- Water Bodies, Rivers

Data compiled by HDR Alaska, Inc.
September 2002

Source of data from:
Municipality of Anchorage,
Matanuska-Susitna Borough,
Department of Natural Resources,
USGS

Map is projected to Alaska Stateplane Zone 4, NAD 27.

0.2 0.1 0 0.2 Miles

3.0 CORRIDOR LAND USE CHANGES

The purpose of this update on corridor land use changes is to identify and compare substantial changes in land use patterns between 1984 and the present in the affected project area. This review generally considers overall land use and master plans as they relate to residential, commercial, industrial, and parks and open space lands. The general considerations focus on those areas of the plans that could influence the corridor alternatives. Additionally, specific land uses are considered. Conclusions are drawn based on identified changes that could affect the alignment or cost of a Knik Arm Crossing.

3.1 Historic Land Use Data

The 1984 DEIS reviewed 14 comprehensive, master, and management plans for areas affected by a Knik Arm Crossing project. It also referred to three specific land parcels of concern. Table 3-1 lists the land use and management plans considered in the 1984 DEIS and updates used in the current comparison.

Table 3-1. Plans Considered in 1984 and Plans Considered Currently

Plan Considered in 1984 Draft-EIS	Comparable Plan Considered in Current Evaluation
Anchorage Bowl Comprehensive Development Plan, 1984	Anchorage 2020: Anchorage Bowl Comprehensive Plan, 2001
Anchorage CBD Comprehensive Development Plan, 1983	Same plan - no updates found
Port of Anchorage Marketing and Development Plan, Phase II	Updated with Port of Anchorage Master Plan and North Port of Anchorage Access Plan.
Anchorage Coastal Zone Management Plan, 1980	Anchorage Coastal Management Plan Program Document, 1987
Anchorage Wetlands Management Plan, 1983	Anchorage Wetlands Management Plan, 1995
Coastal Scenic Resources and Public Access Plan, 1980	Anchorage Coastal Zone Management Plan Program Document, 1987
Coastal Trail Plan: Ship Creek to Eklutna, 1982	Updated with Areawide Trails Plan, 1997
Eagle River - Chugiak - Eklutna Comprehensive Plan, 1979	Same plan—- no updates found
Matanuska-Susitna Borough Comprehensive Plan, 1983	The Mat-Su Borough currently updates its Comprehensive Plan. These are reviewed as separate entities and are listed in Table 3-2 below.
Matanuska-Susitna Borough Comprehensive Plan: Public Facilities, 1984	Captured in the subarea plan reviews
Matanuska-Susitna Borough Coastal Management Plan, 1983	Same plan. No updates found
Willow Sub-Basin Area Plan	Same plan. No updates found
Fish Creek Management Plan, 1984	Same plan. No updates found
City of Houston Comprehensive Development Plan, 1982	Comprehensive Plan, City of Houston, 1999

The comprehensive, master, and management plans used for the 1984 DEIS were summarized in that document in a table that has been reproduced in Table 3-2. The summaries focus only on those areas of the plans that could be influenced by the alternatives and corridor alignments considered in the 1984 DEIS. The columns in the table hold summaries of each of the plans, and the first column states a general overview of the goals of the plans. The additional columns contain summary information about the residential, commercial, industrial, and parks and open space goals outlined in the plans. Finally, community service goals and any other pertinent information are summarized in the final two columns.

In the 1984 DEIS, three specific land uses were addressed individually as being planned projects that warranted consideration. These uses are summarized below, and the value of considering them in a present capacity is outlined.

- Point MacKenzie Port/Industrial Site—In 1984, this site was under consideration for being developed as a port. Since then, a port has been established at Point MacKenzie. The master plan for the port is considered in a later section of this chapter. This ongoing development supports a Knik Arm Crossing project.

- Susitna Hydroelectric Project—This two-dam development on the Upper Susitna River never progressed beyond study phases. In all likelihood, this project—whether developed or not—would not significantly affect a Knik Arm Crossing project.

- Expansion of State Courts Building—This project was completed, and the State Courts Building was expanded between 3rd and 4th Avenues and K and I Streets. This expansion does not significantly affect a Knik Arm Crossing.

Table 3-2. Plans Considered in 1984 Draft EIS

1984 EIS Land Use Documents Reviewed	Date	General Description	Residential	Commercial	Industrial	Parks and Open Space	Community Services	Other
Anchorage Bowl Comprehensive Development Plan	March, 1984	Focus on goals, policies, and objectives for environment, transportation, parks, energy, and urban development.	Development consistent with natural characteristics of area; encourage higher densities, particularly downtown; consider effects of development on offices there.	Concentrate rather than spread along arterials; establish neighborhood centers; encourage downtown development as multi-use district and encourage government adjacent land uses.	Concentrate industrial development in single-use districts, primarily at Ship Creek and along Alaska Railroad in South Anchorage.	Develop a system of parks, greenbelts and trails, including linear park along Ship Creek. Emphasis on neighborhood and community level.	Avoid extension of utilities through areas to be protected from development. Utilities should precede development.	Encourage energy-efficient development and use of mass transit; follow Coastal Zone Management and Wetlands Management Plans. Encourage historic preservation.
Anchorage CBD Comprehensive Development Plan	Fall, 1983	The plan is described as a strategy on which to base decisions rather than specific blueprint. Goal is integrated multi-use center. Proposes specific projects plus infill development clustering around major downtown anchors.	High density housing should be mixed with other uses.	New retail complex between 5th and 6th/A and D.		Enhancement of pedestrian environment. F street Mall between 4th & 6th and Town Center Plaza between E & F/ 5th & 6th; view walk linking new small parks with Resolution Park (locations are 6th & L, 4th & L, 3rd & H).	New parking structures at 5th & C, 4th & I, and 7th & H; State office complex on 5th between A and Barrow.	Designates area generally between 3rd & E and G as "Town Center" or civic core, includes mall, plaza, performing arts, and convention centers, plus several government buildings. Supports preservation of historic resources (e.g., Municipality plans to relocate historic homes to Quyana Park at 3rd & C for office and commercial uses)
Port of Anchorage Marketing and Development Plan, Phase II	1983	Focus on improving the utilization of existing port lands. It also views Fire Island as the best long-term option (beyond 2000) for providing for port growth, particularly in terms of bulk products			Circulation, storage, and berth improvements planned on existing port site. Will discourage non-cargo use of waterfront.	Municipality should acquire waterfront lands and provide access to shoreline.		Goal is to remain major cargo center.
Anchorage Coastal Zone Management Plan	1980	Management boundary includes area of coastal flooding plus adjacent floodplains, wetlands, lakes, and stream to 1,000-ft contour; excludes Federal land. Designates Areas Meriting Special Attention (AMSA) warranting preservation or careful development planning.			Port of Anchorage area is an AMSA guide to growth of water dependent uses.			Goal is to balance growth with preservation of Coastal area. Most of Coastal Zone classified preservation environment (sensitive natural environment, hazardous lands, coastal flood zone).
Anchorage Wetlands Management Plan	May, 1983	Designates areas of wetlands for protection, conservation, and development. Establishes controls to balance preservation and development. Identifies mitigating measures.	Combine development and conservation by encouraging mixed use development of wetlands; cluster buildings to minimize portion of land covered.			Parks and greenbelts are effective means for conserving wetlands.		Ship Creek Wetlands east of dam designated for preservation; west of dam, they are designated for conservation.

1984 EIS Land Use Documents Reviewed	Date	General Description	Residential	Commercial	Industrial	Parks and Open Space	Community Services	Other
Coastal Scenic Resources and Public Access Plan	1980	Offers plans for development of a coastal trail plus sites along the trail including Ship Creek Dam, Railroad Station, and Resolution Park.				Bicycle path proposed along coastal corridor beginning at Ship Creek Dam; improvements for salmon and waterfowl viewing on north bank at Ship Creek Dam; a continuing series of scenic and recreation improvements along the trail.		
Coastal Trail Plan: Ship Creek to Eklutna	June, 1982	Presents a northern section of Coastal Trail. Trail generally follows Ship Creek to Eagle River; north of Eagle River, it follows the Glenn Highway bike trail with three loops to the coast.				Trail will provide greenbelt to link existing parks and open space areas.		
Eagle River-Chugiak-Eklutna Comprehensive Plan	September 18, 1979	Area divided into urban/suburban development (Eagle River), resource protection (slopes and near streams), and rural development areas (all other).	Focused along Glenn Highway and Eagle River Road with highest densities in Eagle River area. Elsewhere, maintain existing low-density rural character.	Increased level of local employment; major commercial area downtown Eagle River; limited strips and at intersections along Glenn Highway.	Two sites available along Alaska Railroad and two in Eagle River area.	Greenbelts on Eagle River, Fire Creek, and Peter's Creek and areawide trail system linked to Glenn Highway bike trail.	Integrated water and sewer utility for Eagle River, generally private systems elsewhere.	Water/sewer constraints will limit growth; areawide zoning to be implemented.
Matanuska-Susitna Borough Comprehensive Plan	February, 1983	Focus on road-served areas, providing minimum recommendations outside that area; inside road-served areas, do not expand the amount of privately owned land (6 years); coordinated with Willow Sub-Basin Plan.	Most undeveloped private land expected to become residential, maintaining rural densities; create a Big Lake community core on east side of lake.	Expand commercial development, neighborhood and regional (primarily at major intersections and existing commercial areas); no new commercial nodes along Parks Highway.	Industrial and port development in Point MacKenzie area (plan in progress)	Preservation of Little Susitna River Corridor from Parks Highway south, recreation reserves on area lakes; urban recreation as required.	Sewer and water systems at Wasilla and Big Lake; 16 new fire stations, 42 schools, another hospital, added solid waste transfer stations by 2001	Agricultural development southwest of Willow, south of Nancy Lake, Carpenter Lake area, and scattered small sites. Encourage tourism, and resource development.
Matanuska-Susitna Borough Comprehensive Plan: Public Facilities	March, 1984	Detailed recommendations for Borough public facilities and services. Based on population projections in 1983 Comprehensive Plan. Discusses potential to control growth patterns.				Goal is to meet recreational needs of Borough, promote tourism, and protect scenic quality and environment potential. Proposed parks include 17 neighborhood and community parks, mostly in conjunction with schools; and eight State or Borough parks including Lake Lucille and the Little Susitna River/Holstein Road area.	Specifies type, location, quantity, and time-frame for improvements to fire protection equipment and facilities; emergency medical services; solid waste, water, and sewage systems; libraries; museums; historic trails; government offices; schools; and parks.	
Matanuska-Susitna Borough Coastal Management Plan	August, 1983	Plan to balance preservation with resource development. Management area includes townships up to 200-foot contour and selected streams up to 1,000-foot contour. This includes all of the project area.	A review of private development plans will include consideration of impact on natural resource use, range of uses, and quality of use; effect on habitat, water bodies, water and air quality, cultural resources, floodplains, hazardous resources, and subsistence resources; consistency with local land and water use controls; and consistency with AMSA plans. New residential development shall be located in already developed areas. Recommended AMSA include Point MacKenzie Industrial Port/Park, Goose Bay State Game Refuge, Nancy Lake Recreation Area, Palmer Hay Flats State Game Refuge, Knik/Matanuska River Floodplains Area(s) (not in project area), and Susitna Flats Game Refuge.					All new community energy facilities, timber, mineral, transportation, utility, agricultural, and recreation development must be consistent with plan. This includes all development falling under planning, zoning, and subdivision requirements.

1984 EIS Land Use Documents Reviewed	Date	General Description	Residential	Commercial	Industrial	Parks and Open Space	Community Services	Other
Willow Sub-Basin Area Plan	October, 1982	Designates uses for much of the public land within the hydrologic sub-basin of Susitna River Basin. It includes area between Knik Arm and Susitna River.	Areas designated for settlement include Moraine Ridge, Willow, Houston, Wasilla, Big Lake, Knik, and Point MacKenzie. Pear Lake and Ronald Lake areas are designated for settlement/small farms.	Sale of lands for commercial uses will be on a case-by-case basis consistent with plan. No specific areas designated.	Point MacKenzie area is designated for industrial development.	Recreation designations include Iditarod and related trails, Lake Lorraine, Big Lake, Horseshoe Lake, and Little Susitna River. The river is to be buffered from non-compatible uses.		Resource development areas also designated.
Fish Creek Management Plan	April, 1984	Management plan for 45,000 acres of public lands south of Nancy Lake Recreation area, between the Susitna River and the Little Susitna River.	Settlement in Moraine Ridge area at eastern border of management area.	Commercial center at southern end of Moraine Ridge.	Could occur in Moraine Ridge area.	Recreation areas are proposed at seven locations adjacent to lakes and several areas along streams. Iditarod Trail to have 400-foot buffer corridor.	Water and sewer systems anticipated at south end of Moraine Ridge.	Agricultural development is proposed in most of the area (exceptions are Moraine Ridge, along stream, and wetland areas); wetlands designated for wildlife habitat and resources.
City of Houston Comprehensive Development Plan	June, 1982	Aid for decision-makers in guiding growth to meet community goals.	Moderate density along Parks Highway. South of Little Susitna River light density; north of Parks Highway, rural density. Rural density north of river and Parks Highway.	Clustered at three locations on Parks highway; do not mix with residential uses; strip development to be avoided.	Concentrate immediately north of Little Susitna River and south of Parks highway.	Scattered urban parks; open space along Little Susitna River and two large parcels on north and south sides of community. Provide recreation for residents and tourists.	Upgrade emergency services as population grows. Minimize public water/sewer systems.	Two sections in northwest corner of community reserved; also area along Parks highway northwest of commercial area in middle of town.

3.2 Updated Land Use Data

For current evaluation purposes, updated versions of all 14 previously evaluated plans were searched for and reviewed when available. Eight additional land management plans have been developed since 1984 for areas that may affect a Knik Arm Crossing. These plans were also considered in the review update process. Finally, three specific land uses of concern were considered.

To review the updated versions of the comprehensive, master, and management plans, an approach similar to the one used for the 1984 DEIS was used. To this end, only those areas of the plans that could be affected by corridor alignment alternatives were evaluated. The updated plans were considered for overall goals concerning residential, commercial, industrial, and parks and open space development. These considerations are summarized in Table 3-3.

Table 3-3. Updated Comparison Documents Reviewed

Comparison Documents Reviewed	Date of Comparison Document	General Description	Residential	Commercial	Industrial	Parks and Open Space	Community Services	Other
Anchorage 2020: Anchorage Bowl Comprehensive Plan	February 20, 2001	The plan addresses major issues facing the community by assessing the consequences of different choices. It allows the future to be estimated as guided by community goals. The plan gives overall patterns of development to be used as a reference when creating land use decisions. Emphasis is on in-filling and redevelopment to a higher use, transit, and multimodal alternatives.	Residential development near the designated Redevelopment/Mixed Use area and the Town Centers should be medium and high densities. Conservation of residential lands for housing is a high community priority. The overall goal for residential development in this plan is "A variety of housing types and densities in safe, attractive neighborhoods that offer a choice of urban, suburban, and rural lifestyles…"	Since 1990 new retail development has moved away from Downtown and Midtown and been focused in the Dimond Center Area. A substantial amount of commercial and industrial land in use within the Anchorage Bowl is underdeveloped. The plan details areas for more intensive commercial development: Major Employment Centers (3); Redevelopment/Mixed Use Areas (3); Town Centers (7), and Neighborhood Commercial Centers (10).	The Central and Southwest Areas of the MOA have been, and remain, the key areas of industrial development for several decades. The Central Subarea and Ship Creek Area have a significant portion of the underutilized industrial property in Anchorage. The Plan details 3 Industrial Reserve Areas that are being used to ensure that strategically located land is preeminently used for industrial purposes.	Natural Open Space has been added as a new land use category. The plan calls for a sustainable and accessible network of recreational facilities, parks, trails, and open spaces. The plan is also concerned with "preserving and enhancing the scenic vistas, fish, wildlife, and plant habitats and their ecological functions and values."	The plan addresses the following community services as areas of additional focus: transportation system based on land use, a network of utilities and public improvements, opportunities for life-long learning, and encouragement of arts and cultural activities.	The majority of land suitable for development in Anchorage has been developed. The zoning of vacant land must be used to guide future development.
Anchorage Coastal Management Plan Program Document	June 1987	The main purpose of this plan is to "accommodate growth in an environmentally sound manner." The management boundary includes the coastal waters, adjacent shore lands, transitional and intertidal areas, salt marshes, wetlands, and beaches. AMSA are specifically designated so that policies can be developed to preserve, protect, or restore the value for which the area was designated.			The POA Area is designated as an AMSA, because it is an area where the development of facilities is dependent upon the utilization of, or access to, coastal waters.	The Fish Creek Estuary is designated as an AMSA because it is an area of unique, scarce, fragile, or vulnerable natural habitat, physical features, and scenic importance.		With the exception of references to the Anchorage Wetlands Management Plan, this Coastal Zone Management Plan is relatively the same document as the previous version that was adopted in 1980.
Anchorage Wetlands Management Plan	April, 1995	This plan uses the same goals as the Anchorage Wetlands Management Plan from 1983, and adds to them with the goals of "protecting the basic natural functions served by coastal marshes, freshwater marshes, and wetlands," and "preventing public liabilities associated with development in these areas." Wetlands are designated through updated wetlands maps, included in the plan.	The plan recognizes the need for community expansion and development, and works to accomplish standards for development that will minimize alterations to wetlands. To this end, the plan outlines the Best Management Practices that are being used in the Municipality of Anchorage. These Best Management Practices relate to construction activities in local wetlands and upland areas, and are designed to minimize impacts on wetland and water body resources while ensuring efficient, compatible developments. The plan divides all wetlands into 3 major categories. The categories are A, B, and C wetlands, and are detailed as follows: "A Wetlands shall be maintained in their natural state to the maximum extent. Key wetland areas and functions in B Wetlands shall be maintained to the maximum extent in all development activities." C Wetlands are subject to fill depending on what type of zoning they fall within.					Most large tracts of undeveloped land in the Anchorage Bowl are wetlands.

Comparison Documents Reviewed	Date of Comparison Document	General Description	Residential	Commercial	Industrial	Parks and Open Space	Community Services	Other
Areawide Trails Plan	April 1997	The general purpose of this plan is to guide local and state agencies, organizations, and private citizens in establishing trail facilities as part of an overall transportation system. The plan provides direction on the location of trails when dedicating creek maintenance, sewer, drainage, and stream protection easements.				This plan outlines existing trails in the Anchorage Bowl, Chugiak-Eagle River, Turnagain Arm, and Regional Areas, and gives recommendations for upgrades and areas for priority planning. The trail from 2nd Avenue north to Eklutna retains the same vision and alignment as was presented in the 1982 Coastal Trail Plan.		
Comprehensive Plan, City of Houston	April 1999	The plan presents the current conditions in Houston, and specifically details how the residents and planners envision the city developing in the future. It then outlines strategic implementation policies to guide development in the manner envisioned.	Residential development should occur only in areas zoned for residential use, and should be low-density, large lot development. Specific areas will be set aside for medium density, affordable housing, and rental property. No large-scale condominium, townhouses, or other high-density development will be allowed. Overall goal: to maintain the rural residential atmosphere.	Commercial development should also occur only in designated commercial zones. The mixing of commercial and residential land uses should be avoided, except for convenience services in the Neighborhood Commercial Zones. Strip malls should be avoided, by encouraging nonlinear patterns of development. The overall goal is to develop convenient business services to provide goods and services to the residents.	Industrial development should not be located adjacent to residential development, and no industrial traffic should flow through residential areas. Industrial land uses should be located in areas that complement business and commercial services; some specific examples include near the Alaska Railroad and with access to the Parks Highway. The overall goal is to ensure that land is available for industrial development.	Existing recreational areas should be expanded. Geological hazard areas and marginal lands with no existing development should be preserved to develop recreation and open space areas. The overall goal is to develop more parks, greenbelts, and recreation areas as part of the residential development process.	The plan charges that funding needs to be found for the following improvements to community services: upgrade road system, build library facilities and a civic center, increase the presence and utilization of law enforcement and fire protection services, and install a swimming pool at Houston High School. Additionally, the City will monitor the need for piped water and sewage disposal as growth occurs.	The overall goal of development as defined by the City of Houston is to strive to encourage a moderate level of growth that will provide an economic base for employment opportunities. Additionally, the City would like to become more independent of external governmental or economic factors and activities.

Since 1984, additional plans have been developed for areas potentially affected by a Knik Arm Crossing. These plans were also gathered and reviewed. Table 3-4 details the additional comprehensive, master, and management plans that were considered in the evaluation, and the reasons for which they were considered.

Table 3-4. Additional Plans Considered in Current Evaluation

Additional Plans Considered in Current Evaluation	Reason for Consideration
Port of Anchorage Expansion Study, March 2002	This study is being considered as an update to the Port of Anchorage Master Plan.
Port of Anchorage Intermodal Marine Facility, March 2002	This plan is an update to the Port of Anchorage Master Plan.
Port of Anchorage Master Plan, September 30, 1999	This Plan was being developed during the 1984 DEIS; a final version is available for review at this time.
Ship Creek Development Draft Master Plan, March 1999	The Ship Creek area has been the focus of several community planning improvement projects, as well as improvements for the Alaska Railroad, which has its main yard facility in Ship Creek.
Ship Creek Multi-Modal Transportation Plan, December 2000	This transportation plan for the Ship Creek area includes extension of the Ingra-Gambell couplet, improved truck routing, and improved circulation.
Freight Mobility Study, June 2001	This study relates to freight movement within AMATS.
Matanuska-Susitna Borough: Core Area Comprehensive Plan, 1997	The Mat-Su Borough currently updates its comprehensive plan with the use of subarea comprehensive plans. This subarea plan was reviewed for updated information.
Point MacKenzie Port Master Plan, January 1998	This master plan has been created and implemented since the 1984 DEIS.
Big Lake Comprehensive Plan, 1996	The Mat-Su Borough currently updates its comprehensive plan with the use of subarea comprehensive plans. This subarea plan was reviewed for updated information.
Knik-Fairview Comprehensive Plan, 1997	The Mat-Su Borough currently updates its comprehensive plan with the use of subarea comprehensive plans. This subarea plan was reviewed for updated information.

The plans outlined in the table above were evaluated in a manner similar to the examination of the plans outlined in the 1984 DEIS. The overall goals of each plan are outlined in Table 3-5.

Table 3-5. Additional Documents Reviewed

Documents Reviewed for Comparison, not available from 1984	Date of Comparison Document	General Description	Residential	Commercial	Industrial	Parks and Open Space	Community Services	Other
Port of Anchorage Master Plan	September 30 1999	The master plan envisions a phased development to accommodate the Port's existing and future users through the year 2020.			The plan calls for expansion of the port areas in phases, which include improving existing facilities, improving existing access, and expansion of terminals dependant on the actual versus forecasted population increases.			Two addendums to the master plan were prepared to consider ways to upgrade the dock of the port. Both the Intermodal Marine Facility and the Expansion Study fall under Phase I of the Port Master Plan.
Ship Creek Development Draft Master Plan	March 1999	This plan looks at development opportunities south of Ship Creek to integrate this area into the fabric of downtown Anchorage.	The plan proposes community apartments and condominiums.	The plan calls for the integration of retail and office development.	The plan proposes an intermodal transfer center.	The plan offers suggestions for various pavilions, and a walking connection to the downtown.	The plan proposes the construction of a convention center.	
Ship Creek Multi-Modal Transportation Plan	December 2000	This transportation plan for Ship Creek area includes extension of the Ingra-Gambell couplet, improved truck routing, and improved circulation.	The plan includes protection of the livability of the Government Hill neighborhood.	The plan includes enhanced automobile circulation to benefit development and redevelopment of the area.	The plan includes maintenance of the integrity and operational effectiveness of the rail yard.	The plan includes an improved pedestrian/recreational environment along Ship Creek.		
Freight Mobility Study, Anchorage Metropolitan Area Transportation Study	June 2001	This study provides insight into the physical and regulatory needs of the freight industry to promote reliable and cost-effective means to circulate freight within the city and to other destinations served by the hub.			The study presents the concept of developing a primary east-west corridor from the POA to a point on the Glenn Highway near Eagle River. The route would reduce some of the freight traffic going through the city.			A general objective of the study is to support the coordination between transport modes to reduce conflicts and capital improvement costs.
Matanuska-Susitna Borough: Core Area Comprehensive Plan	September 1997	This plan describes land use issues, goals, and recommendations for implementation.	The plan states that the diversity of the people living within the core area is recognized, and should be addressed through encouraging a variety of residential opportunities, including housing types, densities, and styles.	The plan says that a variety of safe, convenient, attractive, and efficient commercial areas are desired, and that these areas should be encouraged in places that have good access and visibility.	The plan encourages the use of existing infrastructure and services by new industrial development. It also encourages location of these improvements in areas that minimize negative environmental impacts.	The plan encourages the upkeep and enhancement of existing parks and recreational areas.		The plan encourages the use of lands for farming at a level determined by the marketplace and individual initiative.
Point MacKenzie Port Master Plan	May 1999	This general master plan was created to guide the Mat-Su Borough in developing a Point MacKenzie Port. The plan builds on the AMSA Plan, and generally describes the characteristics of the port site, identifies potential uses for the port district, and develops a land use plan for the area.	The plan identifies suitable residential lands located in an area removed from the port, to the east and north of Lake Lorraine.	The plan says that all commercial uses not directly related to the functions of the port should be located away from the area between Terminal Moraine and Cook Inlet, and closer to Lake Lorraine.	The plan states that all port-related industrial uses should be located west of Terminal Moraine between Lake Lorraine and the Port.			The plan acknowledges the importance of linking to the POA through a Knik Arm Crossing, and proposes to reserve an area in the vicinity of Cairns Point for development alternatives, such as a future crossing.

Big Lake Comprehensive Plan	February 1996	The Big Lake Area is recognized as a residential and recreational community, and this plan outlines a vision to maintain this character of the area Any development within the community should be compatible with maintaining and conserving the natural environment.	The plan encourages residential uses to apply for designation as residential land use districts. Additionally, it notes that area-wide land use regulations to address activities that would be objectionable in residential areas should be considered. The overall goal is to maintain a quality residential area.	The plan encourages location of most commercial development within the community core area. The overall goal is to identify appropriate areas for commercial uses and ensure that they are adequate to meet anticipated needs. Commercial use should be limited to those areas.	The plan supports regional industrial development. It also prohibits heavy industrial activity and encourages light industrial activity within appropriate areas. The railroad corridor to be constructed through the area will make industrial development more viable. The overall goal is to encourage appropriate industrial development.	The plan recognizes Big Lake as a hub of recreational activities for the area. To sustain and improve upon the parks, the plan recommends that an additional plan be written that specifically addresses the parks and recreational activities in Big Lake, after a complete inventory of the existing facilities has been prepared.	The plan also addresses the following community services: water and sewer, electric power, telephone, solid waste disposal, natural gas, postal service, and transportation networks.	An additional goal outlined in the plan deals with the timber resources on public lands, and maintaining a healthy forest in a consistent manner with the character of the planning area.
Knik-Fairview Comprehensive Plan	May 1997	This plan lays an outline to influence future growth in the hopes that development will not contaminate the natural resources and environment or negatively affect residents' lives.	The plan promotes encouraging developers to make a minimum lot size of 1 acre for new development. The development of areas with vacant lots and acreage with roads and utilities should also be encouraged. The overall goal is to maintain the existing pattern of low-density, rural residential settlement.	The plan promotes encouraging commercial development around existing commercial uses, and conditional permitting on a limited basis outside these areas. It also notes that buffering should be used to minimize land use conflicts between non-compatible uses.	The plan calls for light industrial uses to be permitted within established industrial use areas, and to be considered for conditional permits in other areas. Heavy industrial uses will be conditionally permitted within industrial use areas, and will not be allowed in any other areas. Hazardous waste sites are prohibited from the entire area.	The Palmer Hay Flats State Game Refuge is the main focus of the plan. The plan strives to protect, preserve, and enhance the natural habitat, fish, and wildlife populations that exist there. Additionally, the plan outlines a goal of encouraging a variety of recreational, educational, and scientific uses of the area.	The plan also considers the following as important community services: education, public safety, cultural and recreational facilities, water and sewer services, and transportation networks.	The plan points out that Knik-Fairview area functions as a residential suburb of Wasilla and Anchorage, and is heavily dependent on those areas for employment, goods, and services.

3.3 Land Use Summary

Overall, the land use plans that were reviewed have not changed substantially since the 1984 DEIS was prepared. Some substantial land use changes have taken place, however, on specific parcels or groups of parcels that will affect a Knik Arm Crossing project. These particular areas and specific changes in the land use plans that affect a Knik Arm Crossing project are addressed individually below. **Figure 3.1** *(Land Use Issues)* shows the general area of each summary point. **Figure 3.2** *(Land Use Issues)* shows the summary points that relate to the Anchorage Bowl area. Each point is referenced with a letter, and the corresponding letter shows the location on the maps.

- A—The Knik Arm Crossing project is currently not detailed in the Anchorage Bowl Comprehensive Plan and the Matanuska-Susitna Comprehensive Plan. Each plan will require updating to recognize and effectively manage the implementation of the project.
- B—In the 1984 DEIS, the planned Glenn Highway-Northside Bypass was to be a 2.3-mile, six-lane facility to connect Ingra-Gambell Streets to Bragaw Street north of the Glenn Highway. It would have provided an upgraded route to connect the Glenn Highway and Seward Highway corridors. The lack of this connection affects a Crossing project because the bypass would have alleviated some of the traffic congestion that is projected to be caused by a crossing.
- C—The Alaska Native Hospital has been removed from its previous site at 3rd Avenue and Gambell Street. Since its removal, the property has been transferred to the MOA for the purpose of improving access to the POA. This property transfer affects a Crossing by allowing for consideration of a connection at the Ingra-Gambell couplet, provided that access to the POA is improved by the project.
- D—The Ship Creek Development Draft Master Plan, if adopted by the MOA, could impair crossing locations in the Ship Creek area. The effect on locations of a crossing could affect a Crossing project by potentially affecting the previously considered Seward Highway connector on the Downtown alignment. It would also seem to favor alternatives that cross Ship Creek in areas not planned to have residential or retail development.
- E—An Intermodal Transportation Center (ITC) in the Ship Creek Area is currently under consideration. The ITC in Ship Creek would serve commuters and passenger rail, as well as airport traffic to and from TSAIA. This facility would allow people to check their baggage, board and alight from commuter and passenger trains, connect to bus transportation, and walk easily to downtown Anchorage. If implemented, this project could support multi-modal components of a Crossing project.
- F—A possible Ferry Crossing between Anchorage and the Mat-Su Borough is currently under consideration. The Ferry Crossing project analyzes the possibility of establishing a ferry across the Knik Arm. Several potential ferry-landing sites are currently under consideration on the Ship Creek side. One that seems to have more promise for an appropriate landing site is the location at Ship Creek Point. This location is the point farthest west along the Ship Creek drainage. The Ferry Crossing landing location could

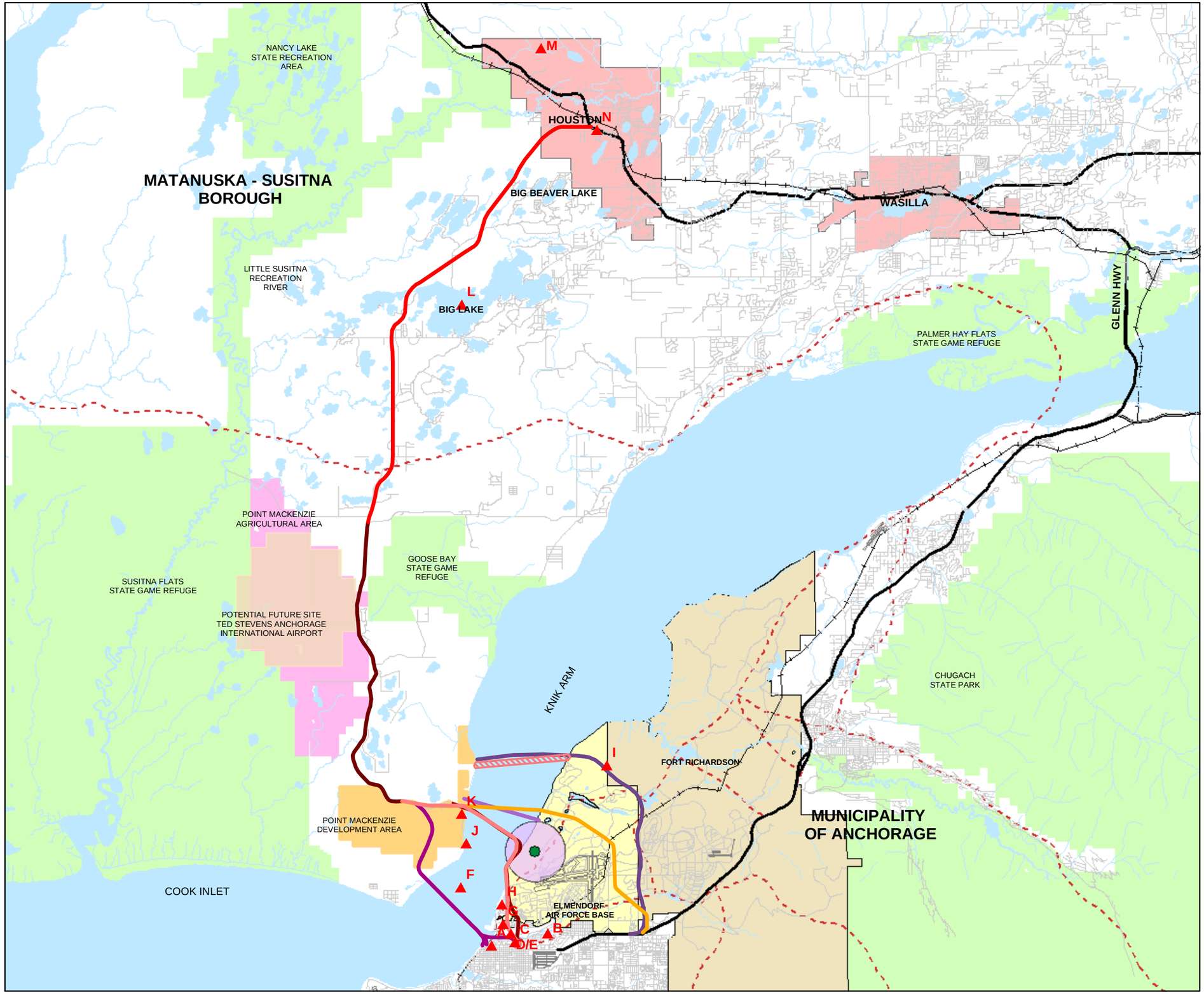
affect a Knik Arm Crossing project by requiring construction to allow for ferry operation. Also, alternative alignments would need to be selected to avoid disrupting terminal alignments.

- G—New parklands exist in the Government Hill Area. These greenbelts surround the neighborhood and are zoned as parks. Because the zoning of vacant land must be considered when future development is considered, the parks need to be considered when determining the best route for a Crossing project.
- H—The expansion of the POA is a supporting factor of a Crossing project, because the POA recognizes the importance of having transportations connections to the Mat-Su Borough from downtown Anchorage. However, the port expansion is another factor that will need to be considered when alignment decisions are made.
- I—Although the land use plans of Elmendorf AFB and Fort Richardson are not currently available for review, it should be noted that the locations of the bases present a challenge. The alignment choices must recognize the heightened national and base security, as well as the importance of the military mission. These factors may significantly increase the difficulty of choosing an alignment that is close to or goes through the bases.
- J—The development of Port MacKenzie presents a supporting factor for a Crossing project. The Port MacKenzie Master Plan specifies that land will be set aside to accommodate a future crossing, and recognizes the importance of having a direct link to Anchorage. This port should be taken into account as a factor when alignments are being considered.
- K—In association with the port development in Point MacKenzie, the Point MacKenzie Access Road has been upgraded. It has been partially paved, widened, and made suitable for truck traffic. This improvement is another supporting factor for a Crossing project.
- L—Because of residential development that has occurred in Big Lake and the strong community sentiment to retain the rural residential atmosphere of the community, any new highway alignment may need to be adjusted so that it does not create a major thoroughfare in the Big Lake area that would attract more commercial and industrial land uses.
- M—The updated Houston Comprehensive Plan does not show significant changes, but the plan does set out to cluster any new commercial or industrial development around the existing commercial and industrial land uses. The new connection will have to be located and designed to support the current center of activity in Houston.
- N—A current study that has the potential to affect the terminus of the Houston Connector is the Parks Highway Corridor Study. This ADOT&PF study will create a long-term vision for the build-out of the Parks Highway. The study will attempt to reduce future right-of-way costs and control access to the Parks Highway, and may include community bypasses, expressways, and realignment components. Any crossing connection for a highway alignment will need to take this plan into consideration.

Knik Arm Crossing Engineering Feasibility and Cost Estimate Update

Land Use Issues

Figure 3.1



Legend

- Land Use Issues

Alignments

- Downtown I Crossing (1984)
- Bluff Project (1984)
- EAFB/FR N-2 Corridor (1986)
- EAFB West-C Corridor (1986)
- Elmendorf Crossing (1984)
- Houston Connector Seg. 1 (1984)
- Houston Connector Seg. 2 (1984)
- ADOT&PF Alignment Crossing (1972)
- Chugach Electric Cable Field
- Elmendorf Antenna Location
- 1 Mile Antenna Buffer Zone
- Trails
- Roads
- Railroad
- City Limits
- Refuges
- Point MacKenzie Development Area
- Point MacKenzie Agricultural Area
- Suggested Future Airport Site
- Water Bodies, Rivers

Data compiled by HDR Alaska, Inc.
September 2002

Source of data from:
Municipality of Anchorage,
Matanuska-Susitna Borough,
Department of Natural Resources,
USGS

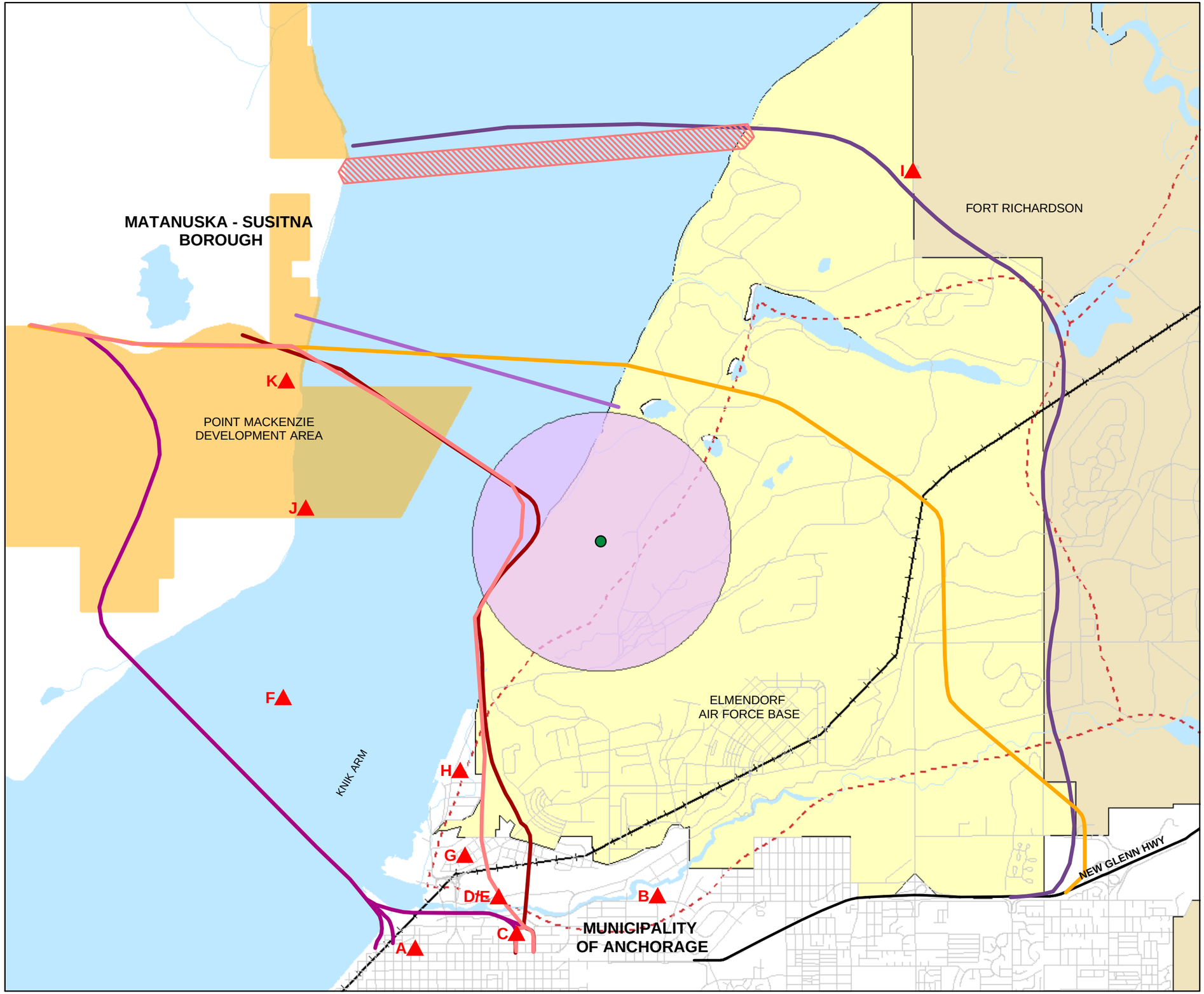
Map is projected to Alaska Stateplane Zone 4, NAD 27.

2.5 1.25 0 2.5 Miles

Knik Arm Crossing Engineering Feasibility and Cost Estimate Update

Land Use Issues

Figure 3.2



Legend

- Land Use Issues

Alignments

- Downtown I Crossing (1984)
- Bluff Project (1984)
- Elmendorf Crossing (1984)
- ADOT&PF Alignment Crossing (1972)
- Elmendorf AFB N-2 Crossing (1986)
- Elmendorf AFB West Crossing (1986)
- Chugach Electric Cable Field
- Elmendorf Antenna Location
- 1 Mile Antenna Buffer Zone
- Trails
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- Railroad
- Point MacKenzie Development Area
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Data compiled by HDR Alaska, Inc.
September 2002

Source of data from:
Municipality of Anchorage,
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USGS

Map is projected to Alaska Stateplane Zone 4, NAD 27.

0.5 0.25 0 0.5 Miles

4.0 ALIGNMENT ISSUES UPDATE

The purpose of this Alignment Issues Update is to identify and update the specific project alignment issues associated with implementation of a Knik Arm Crossing project. In this chapter, historic project alignment issues are summarized and new alignment issues that have evolved since issuance of the 1984 DEIS are discussed.

4.1 Historic Alignment Issues

4.1.1 Alaska Department of Highways "Knik Arm Highway Crossing Study," 1972

In 1972, the Alaska Department of Highways explored the technical and engineering problems associated with a structure across Knik Arm. Roadway connections and comprehensive impact analysis were not a part of this evaluation. The following conclusions were presented in the report:

1. The construction of a crossing is a feasible undertaking.
2. A bridge is the most advantageous type of structure. A double-deck, orthotropic Warren truss with a 400-foot-span length was determined to be the most economical structure.
3. A bridge crossing would have no direct effect on the natural environment of the Knik Arm area.
4. The favored crossing site was located about 1.5 miles upstream from Cairn Point. The maximum depth of water at this location was reported to be approximately 70 feet. Northward of this location, an alignment would offer no advantage due to no significant decrease in water depth, but would require a considerably longer crossing. A southward shift would decrease the crossing length, but would place it over substantially deeper water.
5. The bridge length was approximately 12,900 feet in length from bluff line to bluff line, although a more economical solution may be to extend beyond the bluff lines in lieu of providing extensive construction for slope stabilization.
6. The estimated project cost for the most favorable type and location of a crossing was $140 M, including $126 M for bridge construction costs.
7. A Cairn Point alignment was difficult due to the extreme depth of water (175 feet) and the need for a long-span (suspension) bridge crossing. It was not the most favorable solution due to its relatively high cost of construction ($249 M).
8. Concurrence of federal authorities in the location of the eastern terminus and approach highway on military property would be necessary.
9. Additional studies of foundation soils, both on-shore and underwater, would be needed before further project development to determine the best location for the bridge.
10. Additional field investigations would be necessary to arrive at economical solutions of problems associated with ice and water currents.
11. Additional engineering design studies should only be initiated after additional subsurface information is available.

The location of the 1972 Crossing recommendation is shown in Chapter 2, **Figures 2.1 and 2.1-A**.

4.1.2 "Final Corridor Alternatives Analysis," December 5, 1983

As part of the 1984 DEIS, alternative corridors were evaluated for the best combination of positive features, including low cost, ease of implementation, minimal adverse environmental impacts, and maximum benefits. Corridor evaluations were documented in the report entitled "Final Corridor Alternatives Analysis," December 5, 1983.

Corridor alternatives analyzed included the following:

- South Approach/Crossing Corridors
    - Point MacKenzie
    - Downtown
    - Elmendorf
    - Fort Richardson
    - Eagle River

- Crossing Configurations
    - Bridge
    - Causeway
    - Tunnel
    - Combination bridge and causeway

- North Approach Corridors
    - Wasilla
    - Big Lake
    - Houston
    - Nancy Lake
    - Willow

The following corridors and crossing configurations were found to contain characteristics that, despite their positive aspects, made them unreasonable to consider further in the EIS:

- South Approach/Crossing Corridors
    - Point MacKenzie would encroach to an unacceptable degree on the Ted Stevens Anchorage International Airport air clear zone; would have high cost in relation to traffic volumes that creates an unacceptable rate-of-return; would have a greater risk of accidents than another location; and would not permit incorporation of a railroad.

    - Downtown II would encroach in an unacceptable manner on the Elmendorf AFB airfield clear zone and would be at the minimum permitted distance to the Elmendorf CDAA. The alignment involved water depth ranges of up to minus 196 mean sea level (MSL) in Knik Arm at 3,000 feet west of the south shore. Along the deepest portion of this corridor, for a distance of 3,500 feet, the sand

and gravel deposits ranged from a depth of 10 feet to 145 feet and were considered to have variable support capability, with the top layer offering little support and the lower layers offering full support. On both flanks of this trough was a layer of soil identified as possible remnants of Bootlegger Cove Clay, which was considered incompetent for structural support and ranged from 25 feet to 75 feet in depth. The only crossing configuration determined to be feasible at this location due to water depth was a long-span suspension bridge, with a construction cost estimate of approximately $450 M. This structure would conflict with the Elmendorf aviation clear zone, however, with approximately 120 feet of air space penetration. The report provided costs estimates for a low level 500-foot span bridge at this location at $615 M and determined the costs to be unacceptable and unreasonable. Altering the orientation of the Elmendorf AFB airfield to eliminate the air clearance impact from a bridge was determined to not be possible. The only option was relocation, which was found to be cost prohibitive. A tunnel was determined to not be an option at this location due to water depths.

  - Fort Richardson would limit the incentive for development to occur in the Point MacKenzie area and would have an unacceptable return on investment.

  - Eagle River would have unacceptable low levels of travel and community development benefits, including not opening access to the proposed development area at Point MacKenzie. In addition, the rate of return on investment would be unacceptably low.

- Crossing Configurations
  - Tunnel construction costs and timeframe would be unacceptably high.
  - A causeway dam would cause unacceptable changes to the natural environment and would be more costly to build than a bridge.
  - A bridge and causeway combination would be more expensive to build and maintain than a bridge and would substantially alter the patterns of currents and sedimentation in Knik Arm.

- North Approach Corridors
  - Willow would have a substantial biologic impact, and would be more costly than most alternatives farther east. Natural resource development objectives would be best met by the Willow north approach, however. The Willow corridor would not attract to the Crossing the traffic volume and toll revenue that would be generated by access through the Big Lake/Wasilla urban growth area. Such loss of toll revenue would reduce the financial feasibility of the crossing. It should be noted that the Alaska Department of Natural Resources and the Mat-Su Borough supported the Willow route because it would open up Borough and State lands containing recreational, agricultural, and natural resources that could contribute to diversification of the State's economy and help develop an economic base for the Borough.
  - Nancy Lake would have unacceptable characteristics similar to the Willow

corridor, plus would introduce unacceptable impacts to the Nancy Lake Recreation Area along the Nance Lake Parkway.

- Big Lake would have a circuitous route from the Big Lake/Wasilla area of new development, which would reduce the number of trips from that area that would use a crossing, as well as reducing the diversion of trips from the Parks Highway.
- Wasilla would pass through the Goose Bay State Game Refuge, which is a Section 4(f) resource. This corridor was dropped because a prudent and feasible alternative existed. The Mat-Su Borough stated that it was not realistic or desirable to direct traffic that has no reason to go to Wasilla, through Wasilla, in order for it to connect to points to the north.

The remaining corridor alternatives were included in the DEIS for detailed evaluation and are shown in Figure 2.1 and 2.1-A.

- South Approach/Crossing Corridors
  - Downtown I
  - Elmendorf AFB
- Crossing Configuration
  - Bridge
- North Approach Corridor
  - Houston

Corridor alignment issues identified for these recommended alignment alternatives in the "Final Corridor Alternatives Analysis" (December 5, 1983) included the following:

- The greatest shift in urban growth to the Mat-Su Borough would occur with the Downtown I corridor; the Elmendorf corridor would result in 3/5ths of the growth shift.

- The Downtown I corridor does not work efficiently without a bypass of through traffic around downtown to the Seward and Glenn Highways. Access ramps were provided for the downtown area with this alternative.

- An extension of the Seward Highway north to the Crossing south approach road was evaluated with the Downtown I corridor. The Crossing assumed that a Northside Bypass (a westerly limited-access extension of the Glenn Highway) would be in place. The corridor report noted that additional capacity would be required on a Northside Bypass due to increased traffic volumes and a Crossing at this location could preclude design options for a Northside Bypass and necessitate design modifications.

- A negative of the Elmendorf corridor alternative is that it did not provide an Anchorage Port connection for freight movement.

- It was determined that a Boniface Parkway connection to the south would improve the traffic projections of the Elmendorf alternative.

- To capture the maximum number of trips on the Crossing, the ideal north approach road location was determined to be a straight north-south connection between the Crossing and the Parks Highway, passing through the developing Point MacKenzie and Big Lake/Wasilla growth area. Local "feeder" roads from the north approach road to the communities along the corridor would be important in providing the maximum access to the crossing.

- The Downtown I corridor would best meet the transportation and urban development objectives of the Anchorage and Mat-Su area.

- All corridors would reduce the need for improvements on the Glenn and Parks Highway.

- Total development effectiveness would be greatest with the Downtown I south approach and crossing combined with a Willow north approach road.

- The corridors with the best cost-effectiveness ratios would be the Elmendorf and Fort Richardson south approach and crossings and the Houston and Willow north approach roads.

- The cost-effectiveness ratios for the Downtown corridor would be higher, despite high effectiveness, because of high cost. They would rank even higher in relation to the Elmendorf and Fort Richardson corridors due to low environmental impact avoidance and implementation effectiveness.

- Taking into account all the development, impact, and implementation objectives, the Elmendorf and Fort Richardson corridors would rank high most consistently.

- The Houston and Big Lake north approach roads rate best in terms of environmental impacts.

- The Elmendorf highway bridge alternative would provide for future addition of a single-track rail across the Elmendorf highway bridge alternative. A railroad crossing was determined to not be economically feasible in conjunction with the Downtown I highway bridge crossing. Also, the Downtown Route would not support a rail system because of the height of the approaches.

- The Elmendorf AFB antenna field was determined to be the pre-eminent alignment concern. Highways, expressways, and railroads must be at least one mile away to avoid interference with the CDAA. Relocation costs for the CDAA were estimated at $400 M. U.S. Air Force (USAF) experts indicated that the shielding provided by the bluff would be inadequate.

- It was determined that an Elmendorf alignment must be outside the 3,000-foot air clearance zone at the end of the Elmendorf runway.

4.1.3 Draft Environmental Impact Statement (DEIS), August 31, 1984

The two Crossing Alternatives recommended for further study in the 1984 DEIS were the Downtown (I) Project and the Elmendorf Project. The route and makeup of both the Downtown and Elmendorf projects, which both include the Houston Connector, are shown in Chapter 2, **Figure 2.1** and **Figure 2.1-A**. The No-Crossing Alternatives were the No-Action, Glenn/Parks Improvement, and Hovercraft. Auxiliary facilities included provision for a rail line on the Crossing in the Elmendorf corridor only and provision for utilities with both crossing corridors.

Downtown Alternative

The Downtown Alternative included a 5.5-mile, four-lane crossing between I and L Streets in Anchorage and a planned extension of the Point MacKenzie Access Road in the Mat-Su Borough. The Downtown project also included a four-lane elevated Seward Connector (from the Crossing to Ingra and Gambell Streets at 3rd Avenue) for an additional 1.5 miles. A connection with the POA via two one-lane ramps on the west side of the Alaska Railroad mainline track was part of the Seward Connector.

The central feature of the 3-mile Knik Arm crossing included a single-level, four-lane, cable-stayed bridge. Navigational clearances were 1,000 feet wide and 150 feet above mean higher high water (MHHW) under the main span. The U.S. Coast Guard (USCG) had yet to identify the navigational course. The two towers supporting the cable-stayed spans would project approximately 30 feet into the aviation clear zone for Merrill Field. No provisions were made for non-motorized vehicles or pedestrians on the bridge.

The Downtown Crossing also included a Houston Connector to the Parks Highway near Houston. A 28.7-mile, 400-foot-wide, limited-access (access only at intersections) right-of-way would be required throughout this segment to provide adequate width for future inclusion of additional travel lanes, a path for non-motorized vehicles or pedestrians, future utilities, frontage roads, future upgrading to full-grade separation interchanges, and buffer space to protect adjacent land uses from roadway noise and visual impact. Initially, fencing would not be provided; some locations in the future may be required. The Houston Connector is comprised of two parts:

1. Segment 1: an 11.7-mile, four-lane, limited-access road from the crossing to the east-west segment of the Point MacKenzie Access Road, including five at-grade intersections (south of Lake Lorraine, south of Twin Island Lake, west of Lost Lake, Holstein Heights Subdivision [Point MacKenzie Agricultural Area], and the east-west segment of Point MacKenzie Access Road).

2. Segment 2: a 17-mile, two-lane, limited-access road north to the Parks Highway with six at-grade intersections (east of Jewell Lake, Irish Hills Subdivision, south Big Lake Road, Horseshoe Lake Road, west of Beaver Lakes, and at the Parks Highway) and a 400-foot bridge at the narrows between Big Lake and Mirror Lake (USCG vertical clearance not determined). A structure would also be provided at the Iditarod Trail crossing. Tollbooths were located on the Mat-Su end of the crossing between the bluff and the first interchange.

The Downtown Project included the following cost components:

- Crossing costs (1985 dollars)—$33.6 M (6.4 percent) for engineering, $1 M for right-of-way, and $522.9 M for construction, plus $72.3 M for inflation to construction costs, totaling $629.8 M

- Seward Connector costs (1985 dollars)—$6.9 M for engineering (6.4 percent), $8 M for right-of-way, and $107.9 M for construction, plus $134.4 M for inflation to construction costs (note potential computational error from 1984 DEIS), totaling $257.2 M

- Houston Connector costs (1985 dollars)—$6.7 M for engineering (13 percent), $4.5 M for right-of-way, and $51.4 M for construction, plus $12.9 M for inflation to construction costs, totaling $75.5 M

Estimated costs for the Downtown Crossing were $1,107 M (1985 dollars) for the total project and $1.54 M (1985 dollars) for annual maintenance. Updated estimates of project costs were prepared following the 1984 DEIS, as reported in "Implementation Options, Volume 1" (February 28, 1985). The $1,107 M cost estimate was higher than that presented in the 1984 DEIS because it reflected the results of a preliminary geotechnical-boring program in Knik Arm during the summer of 1984. Foundation materials, particularly in the path of the Downtown Crossing, proved less favorable to bridge construction than earlier anticipated, which raised serious questions of feasibility for the Downtown Crossing. The 60 percent higher cost of a Downtown Crossing appeared unlikely to generate proportionately higher benefit, according to the "Implementation Options" report.

Elmendorf Alternative

The termini for the Elmendorf Crossing were an interchange with the Glenn Highway near Muldoon Road in Anchorage and an intersection of the Parks Highway near Houston in the Mat-Su Borough. The crossing segment of the Elmendorf alternative was described as a 6.5-mile, four-lane, limited-access road through Elmendorf AFB and a planned Point MacKenzie Access Road in the Mat-Su Borough, including a 2.5-mile bridge over Knik Arm. The proposed bridge was a double-level K-truss with a 30-foot roadway on each level. For rail accommodation, the upper level would support four lanes of traffic and the lower level would support the railroad. The roadway was a fully access-controlled, four-lane, divided highway, including a 300-foot wide right-of-way and fencing at the right-of-way boundary. A half-diamond interchange was located at Oilwell Road. Thirteen bridges would be required through this segment, including two over the Alaska Railroad and one over Ship Creek. Vertical clearance was provided for small craft only and the Chugach Electric maintenance barge. No provisions were made for pedestrians or non-motorized vehicles. The second key component of the Elmendorf Crossing was the Houston Connector, as previously described for the Downtown Crossing.

The Elmendorf Crossing included the following cost components:

- Crossing costs (1985 dollars)—$26.8 M for engineering, $1 M for right-of-way, $89.1 M for relocation, and $367.5 M for construction, plus $47.2 M for inflation to construction costs, totaling $531.6 M

- Houston Connector costs (1985 dollars)—$6.7 M for engineering (13 percent), $4.5 M for right-of-way, and $51.4 M for construction, plus $12.9 M for inflation to construction costs, totaling $75.5 M

Estimated costs for the Elmendorf Crossing were $698 M (1985 dollars) for the total project and $1.5 M (1985 dollars) for annual maintenance. The railroad addition was estimated at $50 M (1985 dollars) for the Elmendorf Alternative. Similar to the Downtown Crossing, the project cost estimate of $698 M reflected an update following the 1984 DEIS, because it included the results of a preliminary geotechnical-boring program in Knik Arm during the summer of 1984.

Alternative Selection

The evaluations of the Downtown and Elmendorf Crossing alignments were based on benefit-cost analysis, environmental impacts, cost-effectiveness, financing, conceptual costs, urban growth, and travel forecasts. The following were primary alignment issues:

- Traffic volumes and flow
- Growth and economic development
- Urban and military function and operation
- Biological resources and wetlands
- Air quality
- Section 4(f) resources

For reference, the populations of Anchorage and the Mat-Su Borough in 1983 were 230,900 and 30,600, respectively. Growth forecasts for the Anchorage and Mat-Su region were based on the comprehensive plan forecasts for Anchorage and the Mat-Su Borough. The baseline population estimates for the region included the following:

- 1983 population of 261,500
- 2000 population of 398,200
- 2010 population of 484,000

Mid-range traffic forecasts in the DEIS indicated that a Downtown Crossing would carry 31,500 Average Weekday Daily Traffic (AWDT) in 2001 and 42,300 AWDT by 2010. The Elmendorf Crossing would carry 22,100 AWDT in 2001 and 30,100 AWDT in 2010. These volumes assumed a toll schedule indexed to a $1.00 auto toll. A longer distance between downtown Anchorage and the Borough with the Elmendorf Crossing accounts for Elmendorf's lower forecasts—30 percent less traffic diversion.

Alignment issues and impacts with the Downtown Alternative, as summarized in the 1984 DEIS, included the following:

- A significant change in the pattern of travel and growth would occur in the region containing the Municipality of Anchorage and the Mat-Su Borough. In addition, a limited amount of new growth would be induced.
    - Most of the new growth would occur in the Point MacKenzie, Knik, Big Lake, and Houston areas.

  - Anchorage growth would occur at slightly lower densities.
  - Borough growth would occur at higher densities and in different locations than were identified in planning documents.
  - Borough resource development would be enhanced.
- Change in employment location patterns, with some induced jobs
- Change in public service needs and costs
- Shortfall of locally generated revenues required to meet costs in the Mat-Su Borough
- Impacts to Hostetler Park in Anchorage
- Farmland impacts
- Wetland, fish, and wildlife impacts

Alignment issues and impacts with the Elmendorf Crossing, as summarized in the 1984 DEIS, included the following:

- A significant change in the pattern of future travel and growth in the region, with accompanying effects similar to those for the Downtown Crossing
- Changes in densities, location of growth, and public service needs similar to those described for the Downtown Alternative, but moderated by the smaller changes in growth patterns
- Shortfall of locally generated revenues required to meet costs in the Mat-Su Borough
- Alternative not in compliance with the State Implementation Plan for Air Quality Conformity (for CO emissions)
- Displacement of one single-family home
- On Elmendorf, displacement of a landfill, portion of storage yard, borrow area, gate, aeronautical receiver antenna, and Federal Aviation Administration antenna; crossing of numerous roads and trails; and taking of 18 acres of AFB recreation land (16 percent)
- Farmland impacts
- Wetland, fish, and wildlife impacts

Following the 1984 DEIS, subsequent cost, revenue, and phasing analyses were conducted, and the Elmendorf Crossing was selected for detailed implementation analysis. A Final EIS was never completed.

Bluff Project Alternative

In addition, as part of the "Implementation Options" (1985) analyses, additional consideration was given to a southerly approach route to the Elmendorf Crossing. The route began in Downtown Anchorage and followed the bluff on the east side of Knik Arm to approximately the location of the Elmendorf Bridge, where it crossed Knik Arm. The route included was aligned below the bluff near Cairn Point, east of the POA and Government Hill (below-grade roadway through a portion of the Government Hill neighborhood), and connected with the intersection of the Seward and Glenn Highways. This alternative route, called the Bluff Project, was considered

during the corridor alternatives analysis phase, but was rejected because it would penetrate the clear zone around the CDAA at Elmendorf AFB (relocation estimated at $400 M). The report theorized that if this penetration could be acceptable to the USAF, a lower cost and higher benefit (more efficient traffic distribution) bridge approach would be available. Also, if at some future date the CDAA clearance standard were relaxed or the facility replaced or eliminated, the Bluff Project would be worthy of serious consideration. A financial analysis for the Bluff Project was performed as part of "Implementation Options, Volume 2." Estimated project costs for the Bluff Project were $648 M (1985 dollars, assuming a conservative cost scenario). The Bluff Project alignment is shown in Chapter 2, **Figure 2.1** and **Figure 2.1-A**.

Significant unresolved alignment issues identified in the 1984 DEIS for the Elmendorf project included the following:

- USCG bridge clearance requirements had not yet been determined for Knik Arm and Mirror Lake.
- More detailed habitat value analyses were necessary to develop a mitigation program for impacts to wildlife habitat resulting from increased development in the Mat-Su Borough.
- USAF development of a highway alignment through the base that would serve an Elmendorf Bridge had yet to be finalized.
- The Mat-Su Borough was in the process of preparing a land management plan for the Point MacKenzie Area Meriting Special Attention (AMSA) as identified in its Coastal Zone Management Plan. The impact of the alternatives to the plan were pending analysis.
- The MOA was conducting its own study of the fiscal impacts of a crossing.
- Results of a study of the economic feasibility of a railroad on the Knik Arm Bridge were pending because the ADOT&PF Cook Inlet Transportation Study was under way.
- Determination of conformance to the State Implementation Plan for Air Quality Conformity by the AMATS Air Quality Policy Committee was needed.
- The following permits were pending: U.S Army Engineer District, Alaska (Corps) Section 404; Corps Section 10 for construction of structures in navigable waters of the United States, including Knik Arm, Mirror Lake, and Ship Creek; USCG Section 9 Bridge Permit for Knik Arm and Mirror Lake; and Federal Communications Commission permit for aircraft clearance encroachment.
- Department of Defense agreement for use of right-of-way across Elmendorf AFB with the Elmendorf Crossing would need to be obtained

The final conclusion was that once the "best" alignment was chosen for the type of crossing desired, at least three boreholes should be drilled: one at the center of the alignment at the deepest part of the "glacial" trough cut and two boreholes on the flanks. If foundation conditions were found to be unacceptable at the primary alignment, the next most desirable alignment should be similarly explored.

4.2 Updated Alignment Issues

Since completion of the 1984 DEIS and "Implementation Options" (Volumes 1 and 2) reports, many transportation studies, public meetings, and construction projects that have built upon the list of previously identified alignment issues or are potentially related to segments of a Knik Arm Crossing project have occurred.

4.2.1 Updated Alignment Studies

Military Lands

Although the Elmendorf Crossing location appeared optimal at the conclusion of 1984 DEIS studies, alternative highway approach routes were still under consideration.

To undertake a more detailed evaluation of the impacts on Elmendorf AFB caused by a public highway corridor through the base, the Department of the Air Force undertook a corridor analysis study, entitled "Corridor Analysis for the Proposed Knik Arm Crossing, Elmendorf AFB/Fort Richardson, Final Report" (February 4, 1986). The following were purposes of the study:

- Determine the minimum operational impact of a public highway corridor route through Elmendorf AFB, Fort Richardson, or both properties for the proposed Knik Arm Crossing
- Determine the monetary costs, operational impairment, and environmental consequences of the route with minimum operational impact
- Determine operational impacts and costs of the final proposal to be submitted by the State of Alaska

Impact categories included the following:

- Flight operations
- Communications
- Base support
- Recreation and environment
- External agencies—National Oceanic and Atmospheric Administration (NOAA) operates a High Latitude Monitoring Station just south of the Cherry Hill housing

The study concluded that the route that best suited the needs of the military from a mission-operation point of view and the State of Alaska from a transportation-objective point of view generally follows the Air Force/Army boundary north from Muldoon Road and crosses the Knik Arm north of the Chugach Electric cable field. This route was identified as the North-2 route, approximately 45.4 miles in length from Downtown to the Parks Highway near Houston. The North-2 corridor alignment is shown in **Figure 4.1** *(Elmendorf Air Force Base 1986 Corridor Alignments)*. This conclusion and recommendation was based on the following:

- The critical mission of the base was not affected.
- Effects on base support facilities and functions were tolerable.
- Impacts on the base environment and recreation facilities were not unreasonable.
- The route met the overall transportation goals and objectives of the State of Alaska.

- Basic highway and Knik Arm Crossing structure costs were comparable to the costs of the routes selected by the State.

In the corridor analysis final report, the North-2 Alignment project costs were estimated at $339 M to $354 M (adjusted to 1985 cost levels). It is clear in the report that project cost estimates included costs for the Elmendorf highway connection, Base impact costs and the Knik Arm Crossing structure, but it is not clear whether cost estimates included the north approach (Mat-Su Borough) cost components.

An additional West Corridor Study was undertaken to analyze alternatives that connected to the State's Downtown routes. Assuming that the CDAA (antenna system) is not a control, a route with the following attributes was determined to be possible along the toe of the bluffs: (1) does not affect flight operations, (2) stays clear of the high-frequency receiver controls of the Global Command and Control System, and (3) causes less overall impact on Elmendorf AFB than the North-2 route. The ADOT&PF's Bluff Project route, Alternative C, was selected as the most desirable corridor alignment (West-C). The West-C corridor is similar to the Downtown II route in that the highway emerges directly from downtown Anchorage and follows the east coast of the arm northerly to Cairn Point. The Downtown II route then ran into two problems: (1) if it continued north, it affected the AN/FLR-9 antenna system; and (2) if it turned west across the arm, the bridge towers would have extended into the vertical airspace. These problems were two of the reasons for rejecting the route. If the CDAA control did not exist, the West-C route would have a less disruptive influence on all aspects of the continued operation of the Base than would the North-2 Corridor. The report concluded that a full review of the antenna system was recommended for future analysis, and that a crossing far enough north of Cairn Point to allow the use of a low-level structure should be analyzed because the physical impact on the base is low. Cost estimates were not prepared for the West-C Alignment, but project costs basically compare to the ADOT&PF Bluff Project, with an estimated cost of approximately $648 M (1985 dollars). The West-C general corridor alignment is shown in **Figure 4.1**.

From downtown Anchorage to the Lake Lorraine area in the Mat-Su Borough, the West Corridor C route is approximately 8 miles in length, compared to 18 miles for Elmendorf routes, providing a significant improvement in meeting transportation goals and objectives.

Mat-Su Borough

Numerous rail and highway locational studies have been undertaken by the Mat-Su Borough from the early 1990s until present, primarily in connection with the Point MacKenzie Development Area. Land use changes and development patterns related to these locational studies are discussed in more detail in Chapter 3, Corridor Land Use Changes. Following is a brief list of the key transportation studies of locations conducted since the 1984 DEIS. A composite map of these transportation corridors is shown in **Figure 4.2** *(Matanuska-Susitna Borough-Port MacKenzie Highway/Railroad Alignment Alternatives).*

- "Point MacKenzie Transportation Corridor Study," March 2, 1992
  This study involved evaluation of transportation infrastructure needs related to port development at Port MacKenzie in the form of rail and highway systems. Ten transportation corridors were evaluated from Port MacKenzie to the Parks Highway

or the Alaska Railroad mainline. These alignments were based on prior studies, existing road alignments, proposed Mat-Su Borough road projects, existing land uses, and local knowledge. Study Corridor 5 appeared to be the best rail route, with a length of 32 miles from the Port to MP 56.1 on the Parks Highway. The 1992 estimated cost of this rail construction was $44 M. Study Corridor 3 appeared to have the best potential for long-range highway access. This corridor extended from the Port to MP 70.8 of the Parks Highway. The 1992 estimated cost of this new two-lane access highway was $40.5 M. Study Corridor 5 and Study Corridor 3 are shown in **Figure 4.2**.

- Mat-Su Corridor Study, 2002 (currently in progress)
  The Mat-Su Borough is currently conducting a study to evaluate both a rail alignment and a highway alignment from Port MacKenzie to the Parks Highway or Alaska Railroad mainline. This study will build on the "Point MacKenzie Transportation Corridor Study" (March 2, 1992), and other previous studies and will evaluate additional alternative alignments. Draft corridor alignments developed to date are shown in **Figure 4.2**.

Municipality of Anchorage

- "Ship Creek/Port Access—Ingra/Gambell Alternative—Feasibility Study," 1999
  This report evaluated alternatives in the Ship Creek area that included the following objectives:
  - Improved truck access to the POA
  - Improved access to the Ship Creek Redevelopment Area
  - Additional localized transportation benefits, such as improved access to the Ship Creek industrial area, Government Hill, and Elmendorf AFB

  The project limits were from the vicinity of 3rd Avenue to the POA. Three key alternatives were developed (with multiple sub-alternatives) that relate to a Knik Arm Crossing project:
  - Whitney Road-West
  - Whitney Road-East
  - Loop Road

  Project concepts included alternative alignments, elevated roadways, at-grade interchange layouts, and tunnel options. The advantages, disadvantages, and costs were evaluated for each alternative. These three alignments are shown in **Figures 4.3, 4.4, and 4.5** *(Ship Creek/Port Access Alignment Alternatives).*

  Cost estimates for these transportation improvement alternatives were estimated as follows:
  - Whitney Road-West—$35 M to $170 M
  - Whitney Road-East—$35 M to $170 M
  - Loop Road—$50 M to $150 M

- "Ship Creek Multi-Modal Transportation Plan," December 2000
  This report recommended a transportation plan for the Ship Creek area that included the following:
  - Provision of a direct multi-modal access to the Ship Creek area through an extension of the Ingra-Gambell couplet
  - Reduction of Port-related truck trips on the A/C Couplet through downtown Anchorage
  - Uninterrupted truck routes between the POA and both the A/C and Ingra-Gambell couplets
  - Maintenance of the integrity and operational effectiveness of the rail yard
  - Protection of the livability of the Government Hill neighborhood
  - Improved pedestrian and recreational environment along Ship Creek
  - Enhanced automobile circulation into, out of, and within the Ship Creek area for benefit of the area's development and redevelopment plans

  Alternative transportation solutions for the Ship Creek area were identified and then evaluated on their ability to address 13 key objectives. Concept options were developed from a variety of perspectives, including mode of travel, cost of construction, and intensity of future development. The following key roadway improvements were included:
  - Extension of the Ingra-Gambell couplet as a four-lane facility across the rail yards to connect with Loop Road, with access points to both Ship Creek Avenue and Whitney Avenue
  - Direct access from the POA to the A/C Couplet through construction of elevated ramps that cross over the existing intersection of Ocean Dock Road and Port Access ramps
  - Realignment of Whitney Road to the north between the dam and Ocean Dock Road
  - An extension of Ship Creek Avenue west from the ARRC Headquarters building to Ship Creek Point

  Alignment improvement configurations are shown in **Figure 4.6** *(Ship Creek/Multi-Modal Transportation Plan Alignment Alternatives)*. Total project construction cost estimates, including trail, boardwalk, roadway, and transit improvements, were approximately $108 M. In January 2001, however, AMATS dropped the alignment extension north of Whitney Road from the plan due to concerns over the new viaduct section.

Port of Anchorage

- "North Access Corridor Reconnaissance Study," October 1999
  The POA commissioned this study to evaluate the possibility of providing a new multi-use transportation corridor extending northward from the Port. Key findings included the following:
  - The POA is experiencing an access problem that is increasing at a rate directly related to the population growth in Southcentral Alaska.

- The project would provide a positive economic benefit.
- A northern corridor through military bases does not work well with current military training mission activities.
- Corridor preservation was recommended, thereby allowing right-of-way easements, in the event that military training activities change or military land is made available by other means in the future for a northern transportation link to the POA.
- POA expansion constraints include current limited access through constraint road and rail systems in the Ship Creek area, congested access through the Ship Creek and Anchorage Central Business District highway system, and access to POA expansion areas into recently acquired lands north of the existing POA facilities.
- Recommended steps included incorporating the project in the AMATS Long Range Transportation Plan (LRTP) and beginning work under the federal NEPA process.

The study evaluated 14 possible corridor segments for traversing across Elmendorf AFB and Fort Richardson. Each segment was examined with respect to military land use, engineering feasibility, environmental and geotechnical conditions, and project costs. Corridors extended from 10.7 miles to 27 miles in length. Cost estimates ranged from $26.3 M to $71.2 M.

4.2.2 Updated Alignment Issues

The conclusions drawn from the 1984 DEIS and supporting documents regarding general alignment locations form a good basis for updating and reevaluating alignment alternatives for a Knik Arm Crossing project. Alignment issues originally identified in 1984 remain largely unchanged, but new opportunities and constraints exist that warrant reevaluation of previously studied concepts and alignments.

A limited literature search and review of current planning documents was conducted in order to update and identify key issues that may affect the location of a Knik Arm Crossing project. Information regarding current land use and master plans are outlined in Chapter 3, Corridor Land Use Changes. Following is a summary of the updated alignment issues that may have a bearing on where to locate a Knik Arm Crossing project. In addition, in order to readily view alignment issues in relation to potential Knik Arm Crossing corridors, available geographical information system (GIS) mapping was compiled for the project area. Thematic layers were prepared for the following:

- *Hydric Soils, Topography, and Water Bodies,* **Figure 4.7**.
    - Because National Wetland Inventory (NWI) wetlands maps in a digital format were not readily available for the Mat-Su Borough, hydric soils and topography were used to compile a map that represents potential wetland areas and conditions.
- *Wildlife Habitat—Moose and Eagle Nests,* **Figure 4.8**.
    - The most significant potential impacts to wildlife identified in the 1984 DEIS

were to large mammals and associated habitats (moose and bears). Readily available GIS mapping of moose habitat, along with eagle nest sites, are depicted to show where the potential for conflicts with alignments exists.

- *Parks, Trails, and Refuges,* **Figure 4.9,** *and Municipality of Anchorage, Alaska, Parks and Trails,* **Figure 4.10**.
    - Figure 4.10 shows the entire project area and the parks, trails, and refuges that exist throughout the region. The constraints on the alternative alignments imposed by Mat-Su area refuges are notable. Figure 4.11 shows the parks and trails in Anchorage in the vicinity of the alignment alternatives. This figure provides locations of the designated parks and greenbelts surrounding Government Hill.
- *Historic and Archaeological Sites,* **Figure 4.11**.
    - The documented historic and archaeological sites in the project area are depicted to show additional potential constraints on alternatives.
- *Land Ownership,* **Figure 4.12**.
    - This figure focuses on land ownership in the Mat-Su Borough. Land in the project area is owned by many different entities, including the Mat-Su Borough; Alaska Department of Natural Resources; Bureau of Land Management (BLM); Native allotments; Cook Inlet Region, Inc. (CIRI); private groups; and others. The figure depicts the general land ownership in broad categories to represent potential alignment opportunities and constraints.
- *Bathymetry,* **Figure 4.13**.
    - This figure is a visual representation of the bathymetric conditions in the vicinity of the Knik Arm Crossing alignments. The notable feature is the deep submarine trough that exists west of Cairn Point.
- *Geology and Fault Lines,* **Figure 4.14**.
    - The surficial geology and fault lines are depicted in this figure to represent the general conditions in the project area.
- *Contaminated Areas on Superfund National Priority List,* **Figure 4.15**.
    - The approximate locations of contaminated areas on the Superfund National Priority List are depicted in this figure. These point locations were placed on the map by using general x, y coordinates; a location description for each area, and a working knowledge of the areas. Although they are inexact locations, the points can be used to visualize the approximate location of those sites on the Superfund National Priority List. Additional contaminated sites exist in the project area and will need to be fully evaluated in future alignment studies.

In addition, significant individual design constraints were added to the mapping figures. A composite map of some of the most significant design constraints is presented in **Figures 4.16 and 4.17** *(Composite Alignment Issues Map)***.**

For discussion purposes, the three primary segment components for a Knik Arm Crossing are discussed individually: South Approach, crossing of Knik Arm, and the North Approach.

4.2.2.1 South Approach

A Knik Arm Crossing has two travel markets: (1) traffic resulting from residential and industrial growth induced by increased accessibility between the Mat-Su Borough and Anchorage; and (2) diversion of traffic from the Glenn and Parks Highway to a Knik Arm Crossing in order to realize a shorter trip. Crossings into the Anchorage downtown area will compound downtown circulation problems and necessitate other roadway improvements. Crossings that connect into the Glenn Highway through Elmendorf AFB or Fort Richardson will compound circulation problems on the Glenn Highway and offer no alternative access to Anchorage.

The consideration of key transportation network connections on the south approach needs to include land use development and traffic patterns affecting the following:

- Ingra-Gambell/Seward Highway connection
- Glenn Highway
- Glenn Highway/Seward Highway connection
- I/L Street connections (Minnesota Avenue)
- A/C Couplet connections
- Port of Anchorage
- Alaska Railroad

Alignment issues associated with the South Approach are comprised of three primary locations: Downtown Anchorage, Ship Creek Area/POA, and military lands.

Downtown Anchorage

Key alignment issues affecting Downtown alignments in the vicinity of the Crossing connection may include the following:

- Transportation and land use planning—The current AMATS Long Range Transportation Plan and Anchorage 2020 land use plan will require updating to implement a Knik Arm Crossing project.
- Section 4(f) and Section 6(f) resources—historic properties, recreational lands, trails, and parks, including Hostetler Park, Resolution Park, and Quyana Park
- Aesthetics and visual impacts
- Contaminated sites
- Air quality impacts and air quality conformity
- Community service issues
- Community cohesion and community impact assessment
- Right-of-way impacts and relocation impacts
- Environmental justice considerations
- Socio-economic impacts
- Transportation impacts and multi-modal travel accommodations
- Noise impacts
- Utility impacts

Ship Creek Area/Port of Anchorage

Primary alignment issues in the Ship Creek area include the following:

- Alaska Railroad development and redevelopment plans
- Alaska Railroad connection to the Crossing
- POA development plans
- POA connection to the Crossing
- Freight movement
- Concern of Government Hill residents to a crossing through or near their neighborhood
- Right-of-way impacts and relocation impacts
- Contamination sites
- Alignment connections to Downtown across the Ship Creek area
- Section 4(f) and Section 6(f) resources—historic properties, recreational lands, trails, and parks, including numerous parks on Government Hill, the Coastal Trail, Ship Creek Greenbelt, and Ship Creek Overlook Park
- Topography and grade considerations for connections into the Ship Creek area
- Bluff conditions and side slope stability—Three known slide areas exist: the bluff north of 3rd Avenue, the hillside north and west of Government Hill, and the bluff south of Government Hill near Loop Road.
- Aesthetics and visual impacts
- Natural resource issues, including Ship Creek, essential fish habitat, wildlife, protected species, wetlands, terrestrial and aquatic/marine habitats, and water quality
- Floodplains and regulatory floodways, including Ship Creek
- Permitting and Coastal Zone Management issues
- Secondary and cumulative impacts
- Utility impacts
- Construction impacts

Military Lands

New security measures may affect some of the previously studied alignment alternatives. Alignments and security measures would need to be looked at in detail before conclusions could be drawn, but in general, a heightened military mission for both Elmendorf AFB and Fort Richardson will impose complexities for any alignment alternative in the proximity of these military installations.

In addition to heightened security restrictions, crossing Knik Arm at a point that requires a corridor through Elmendorf AFB has the potential to adversely affect the EMC of the base. EMC is a condition in which systems that use the electromagnetic spectrum operate without interference from either the environment or each other. If EMC does not prevail, electronics and communication equipment cannot function as designed, and the missions that they support are consequently jeopardized. Communications, navigation, and electronic surveillance are essential to the mission objectives of Elmendorf AFB.

On Elmendorf AFB, one of the most significant design constraints is the CDAA. This sensitive electronic communications station has restrictive zones of non-development within a one-mile radius. The facility is located in close proximity to the coastal bluffs north of Cairn Point. In addition, airfield operations and munitions storage have specific security requirements and restriction zones for proximity of development. The two primary design constraints identified in the 1984 DEIS for a Cairn Point or Bluff Project alignment were the CDAA and intrusion into the airspace of Elmendorf Air Force Base. According to recent verification with base officials, the CDAA is still important to the base mission and there are no plans to decommission this facility. The one-mile intrusion restriction for the CDAA is still valid and, in fact, there is a three-mile restriction zone for some activities. (For example, lighting on a roadway or bridge structure could potentially affect the CDAA.) In addition to runway clear zone restrictions, any roadway or bridge lighting is a concern for airfield operations.

Relevant to a bluff alignment, the bluff area between the POA and Cairn Point is a Comprehensive Environmental Response, Compensation, and Liability Act site consisting of an old military landfill. Estimated cleanup costs are $120 M. Beach sweeps are conducted annually by the base for newly exposed material from bluff erosion. In addition, any alignments within military lands need to be carefully evaluated for involvement with contaminated sites.

A munitions area north of Cairn Point could also impose a substantial design constraint. Quantity/distance arcs in this area have a three-mile restriction zone (impact range). In addition to issues related to the proximity of a roadway or bridge structure, restriction elements include some types of lighting.

Fort Richardson is currently expanding military operations at its base. The primary activity on Fort Richardson is the movement and training activities of ground-based troops. The development of any transportation corridor through Fort Richardson at this time may conflict with the military mission of the installation.

Overall, a tunnel or bridge/tunnel hybrid facility could potentially be less intrusive to military functions and operations related to electromagnetic compatibility from potential shielding effects.

4.2.2.2 Knik Arm Crossing

Although alignment issues for a Crossing project are dictated largely by the South Approach location, the crossing location itself involves substantial alignment issues, including the following:

- Crossing type—bridge, bored tunnel, immersed tube, or hybrid
- Bridge type—suspension, segmental, and others
- Bridge length
- Bridge specifics—lanes, multi-modal transportation considerations, utility accommodations, bridge architecture, and other details
- Lateral loads to a structure—currents, ice flows, and wind
- Pier protection needs
- Constructibility

- Railroad grade and load factors
- Location—north of both ports if possible and providing economic balance of water depths versus bridge length
- Foundation design and type (significantly affects alignment location)
- Life-cycle cost analysis
- Seismic conditions
- Geotechnical and geophysical issues—position of seabed features, channel contours, bathymetry, distribution of geological units beneath the seabed, substrate conditions, submarine slides, soils, and other considerations. Previous reports indicate an incompetent soil layer from the south shore out one mile into Knik Arm, ranging from 30 to 45 feet in depth. On the Cairn Point alignment, the seabed depth ranges up to -196 MSL at 3,000 feet west of the south shore. Along the deepest portion of this corridor, for a distance of 3,500 feet, the sand and gravel deposits range from a depth of 10 feet to 145 feet and are considered to have variable support capability, with the top layer offering little support and the lower layers offering full support. On both flanks of this trough is a layer of soil identified as possible remnants of Bootlegger Cove Clay, which is Cove Clay. This clay is susceptible to sliding under seismic loading and is considered incompetent for structural support and ranges in depth from 25 feet to 75 feet.
- Shipping and navigation to ports—shipping channel location, navigational safety, and horizontal and vertical clearances
- Knik Landing access (a private dock north of Port MacKenzie)
- Airspace intrusion issues—Elmendorf AFB and Merrill Field. Knik Arm Crossing structures with high support towers located in the approach corridors to airfields could penetrate the flight clearance zones. Acceptable crossing locations would be north of Cairn Point.
- Chugach Electric cable field crossing across Knik Arm
- Military communication systems and restriction zones
- Bluff connections and shoreline features—slide considerations, erodable banks, and slope protection needs
- Wildlife and protected species—Two endangered species are listed as potentially occurring in the Cook Inlet region: Steller's eider and Steller sea lion. Belugas are not listed as threatened or endangered, but they are protected as a marine mammal.
- Anadromous fish
- Coastal wetlands—protection areas
- Permitting and Coastal Zone Management issues
- Commercial and subsistence fishing
- Potential changes of the physical conditions of upper Knik Arm—current, deposition patterns, and other effects
- Visual impacts and viewshed issues

4.2.2.3 North Approach

Similar to effects in the Anchorage area, current transportation and land use plans of the Mat-Su Borough will need to be updated to include a Knik Arm Crossing project. A key objective of the North Approach alignment will be to maximize the service potential to Port MacKenzie and the Point MacKenzie Development Area, including long-range development plans. Additionally, the potential for TSAIA relocation or support airport development should be taken into account for the area west of Goose Bay State Game Refuge. Alignments should maximize economic development potential, land use compatibility, and right-of-way usage of Borough and State lands throughout the Wasilla Sub-basin of the Mat-Su Borough. The potential for natural resource development should also be fully considered. Segment 2 of the Houston Connector may require realignment considerations because of the following concerns:

- Residential, road, and trail developments exist near Big Lake.
- The bridge over Mirror Lake/Big Lake may warrant reconsideration due to costs and impacts.
- The terminus at the Parks Highway may require further study to maximize travel, freight and goods movement, and multi-modal transportation benefits.
- Updated land use plans will require reevaluation.
- Further coordination will need to occur with the City of Houston to fully realize its long-term development plans and plan alignments accordingly.

In addition, general alignment issues for the North Approach include the following:

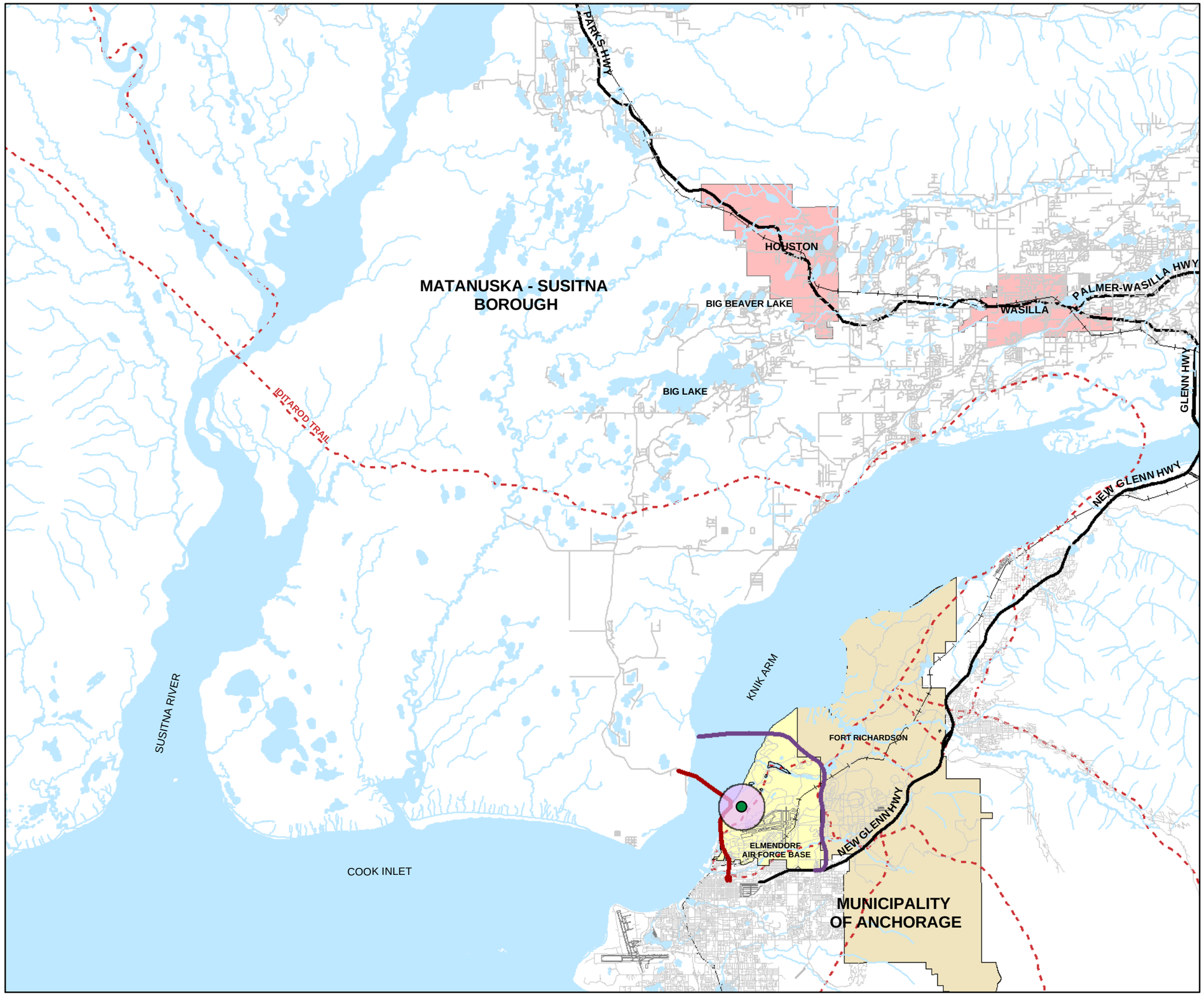
- Land use planning—service to future land uses and major developments, including industrial, commercial, and residential development
- Social and socio-economic impacts
- Community cohesion and community impact assessment
- Community services, infrastructure needs, and financial impacts
- Sprawl development patterns and urban growth
- Right-of-way impacts and relocations
- Native lands and subsistence issues
- Environmental justice considerations
- Resource development opportunities
- Section 4(f) and Section 6(f) resources—historic and archaeological sites, recreational lands and access, trails, refuges, and parks, including the Iditarod Trail, Goose Bay State Game Refuge, Little Susitna River Recreation Area, Susitna Flats State Game Refuge, and Nancy Lake State Recreation Area
- Point MacKenzie Agricultural Area and other area farmlands
- Wetlands, water bodies, and water quality
- Wildlife and habitat impacts, primarily impacts on large mammals such as moose and bear
- Essential fish habitat and fisheries
- Floodplain impacts
- Permitting and Coastal Zone Management issues
- Secondary and cumulative impacts—increased rate of development

- Physical features, including topography, seismic considerations, geology, soils, peat deposits, and gravel deposits
- Material sources
- Railroad grade-separation requirements for some alignment potentials near the Parks Highway
- Air quality impacts
- Noise impacts
- Contaminated sites
- Construction impacts
- Utility routes and utility impacts
- Aesthetics and visual impacts

4.3 Alignment Issues Summary

Since completion of the 1984 DEIS, several significant conditions and land use changes have occurred or are planned in the project area that will affect a Knik Arm Crossing project alignment. In addition to the specific alignment issues discussed above, updated alignment issues in general consist of the following:

- Port MacKenzie has been developed; the Point MacKenzie Access Road has been constructed; and the Point MacKenzie Development Area has been further planned.
- The Alaska Native Medical Center (hospital) at 3rd Avenue and Gambell Street in Anchorage has been relocated, making the land available for a Knik Arm crossing connection.
- Redevelopment and expansion plans are in the works in the Ship Creek area for rail and port improvements.
- New 9/11/01 security restrictions are in place, potentially affecting the viability of locating an alignment through or in proximity to Elmendorf AFB, Fort Richardson, or both.
- New population and growth projections, new and future land use developments, and new socio-economic structures are in place.
- Traffic patterns, changes in future traffic projections, and new roadway improvements have occurred.
- Transportation improvements envisioned in the 1984 DEIS, such as the Northside Corridor, Seward Highway, and Glenn Highway network improvements, have not occurred.
- Residential development has substantially expanded in the Big Lake area, potentially affecting alignments in that location.
- New technologies are available.



Knik Arm Crossing Engineering Feasibility and Cost Estimate Update

Elmendorf Air Force Base 1986 Corridor Alignments

(From the 1986 "Corridor Analysis for the Proposed Knik Arm Crossing, Elmendorf AFB / Fort Richardson, Final Report")

Figure 4.1

Legend

- EAFB/FR N-2 Corridor (1986)
- EAFB West-C Corridor (1986)
- Elmendorf Antenna Location
- 1 Mile Antenna Buffer Zone
- Trails
- Roads
- Railroad
- City Limits
- Water Bodies, Rivers

Data compiled by HDR Alaska, Inc.
September 2002

Source of data from:
Municipality of Anchorage,
Matanuska-Susitna Borough,
Department of Natural Resources,
USGS

Map is projected to Alaska Stateplane Zone 4, NAD 27.

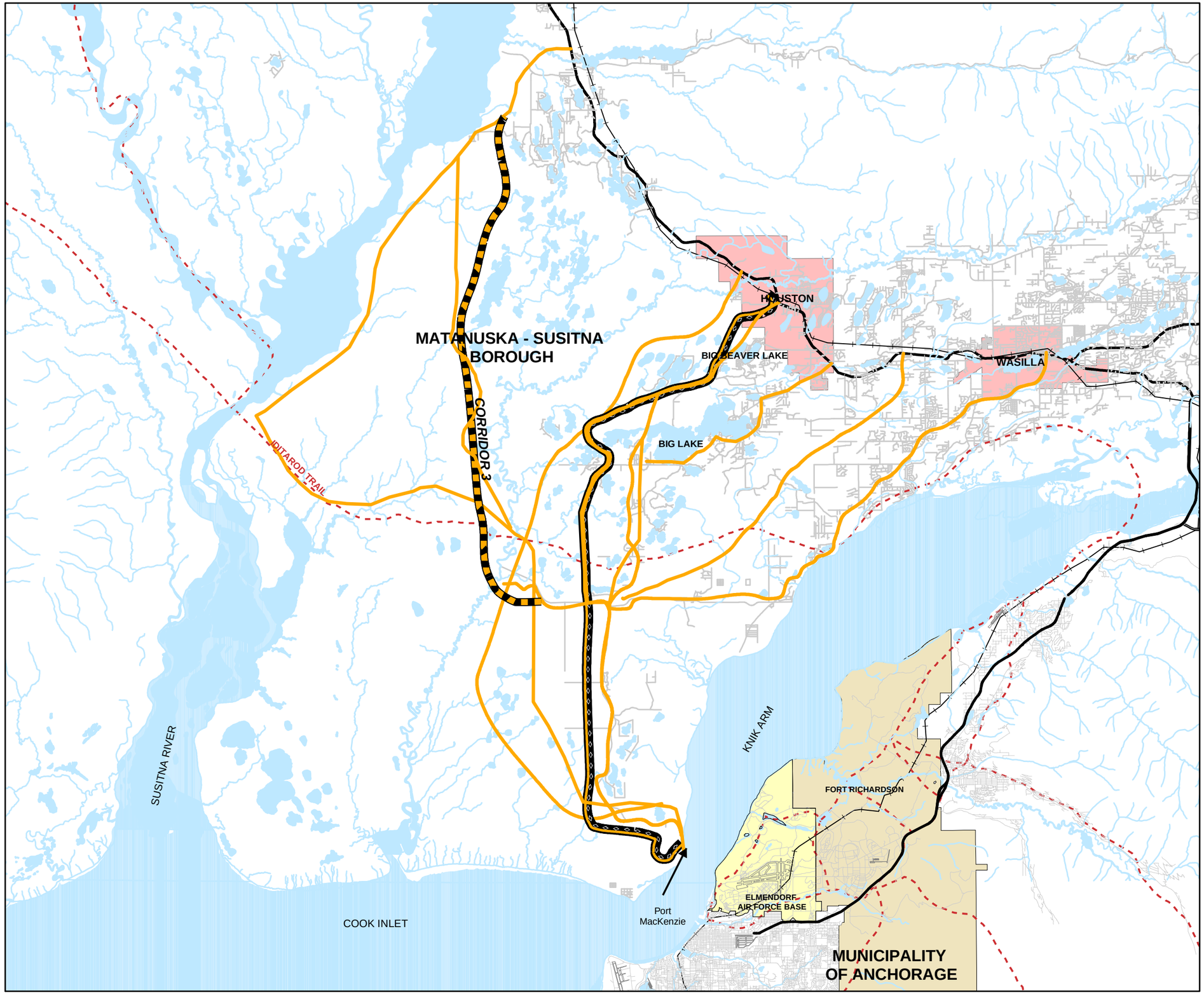
3 1.5 0 3 Miles

Knik Arm Crossing Engineering Feasibility and Cost Estimate Update

Matanuska-Susitna Borough - Port MacKenzie Highway/Railroad Alignment Alternatives

(From the 1992 "Point MacKenzie Transportation Corridor Study")

Figure 4.2



Legend

- Alignment Alternatives
- Corridor 3
- Corridor 5
- Trails
- Roads
- Railroad
- City Limits
- Water Bodies, Rivers

Data compiled by HDR Alaska, Inc.
September 2002

Source of data from:
Municipality of Anchorage,
Matanuska-Susitna Borough,
Department of Natural Resources,
USGS

Map is projected to Alaska Stateplane Zone 4, NAD 27.

3 1.5 0 3 Miles

Knik Arm Crossing Engineering Feasibility and Cost Estimate Update

Ship Creek/Port Access Alignment Alternatives

(From the 1999 "MOA Ship Creek/
Port Access Alignment Alternatives" Report)

Figure 4.3

Legend

- West Whitney Alternative (1999)
- Rivers
- Roads
- Elmendorf Air Force Base
- Water Bodies, Rivers
- Municipality of Anchorage Parks

Data compiled by HDR Alaska, Inc.
September 2002

Source of data from:
Municipality of Anchorage,
Matanuska-Susitna Borough,
Department of Natural Resources,
USGS

Map is projected to Alaska Stateplane Zone 4,
NAD 27.

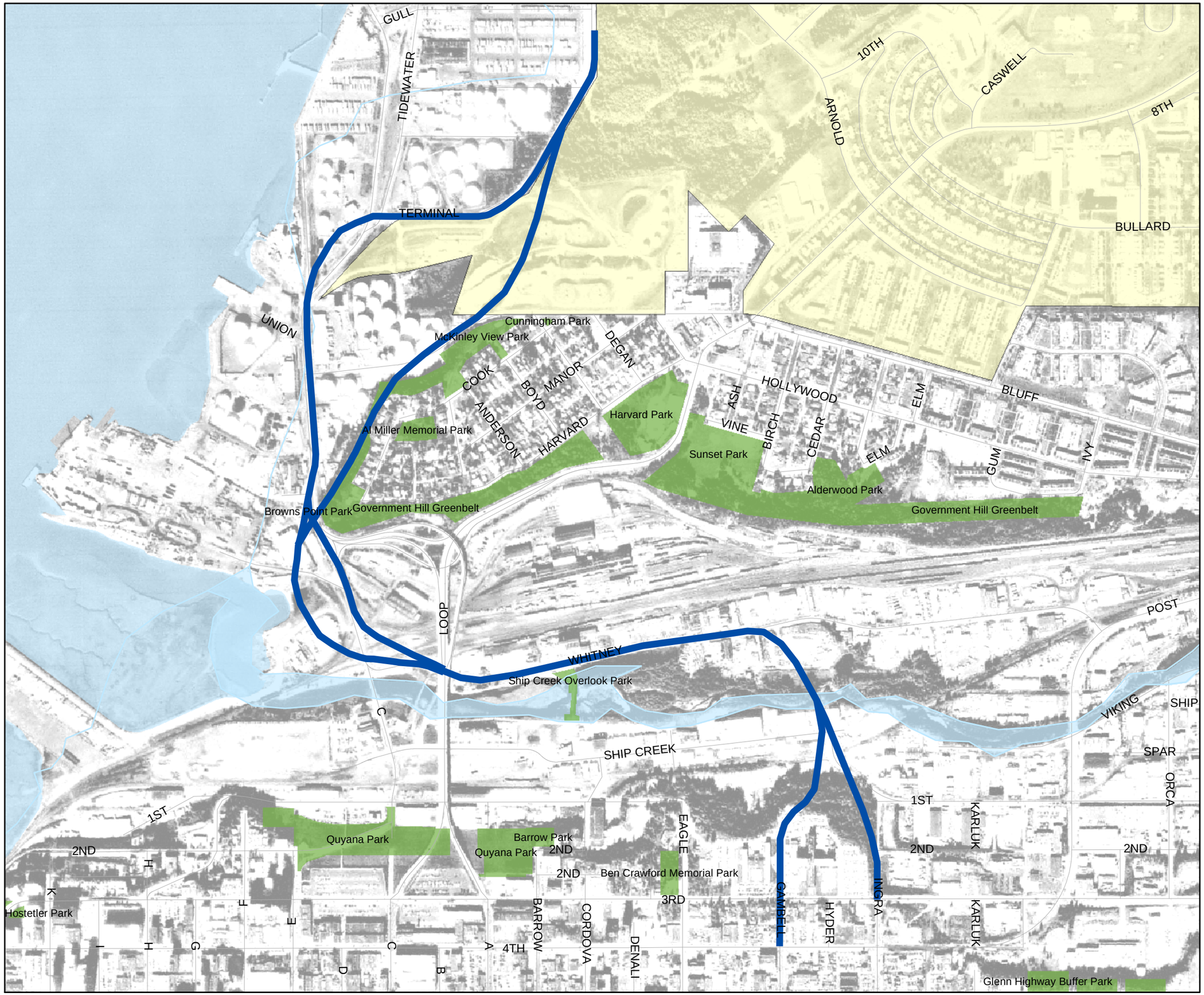
0.1 0.05 0 0.1 Miles

Knik Arm Crossing Engineering Feasibility and Cost Estimate Update

Ship Creek/Port Access Alignment Alternatives

(From the 1999 "MOA Ship Creek/
Port Access Alignment Alternatives" Report)

Figure 4.4



Legend

- East Whitney Alternative (1999)
- Rivers
- Roads
- Elmendorf Air Force Base
- Water Bodies, Rivers
- Municipality of Anchorage Parks

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Department of Natural Resources,
USGS

Map is projected to Alaska Stateplane Zone 4,
NAD 27.

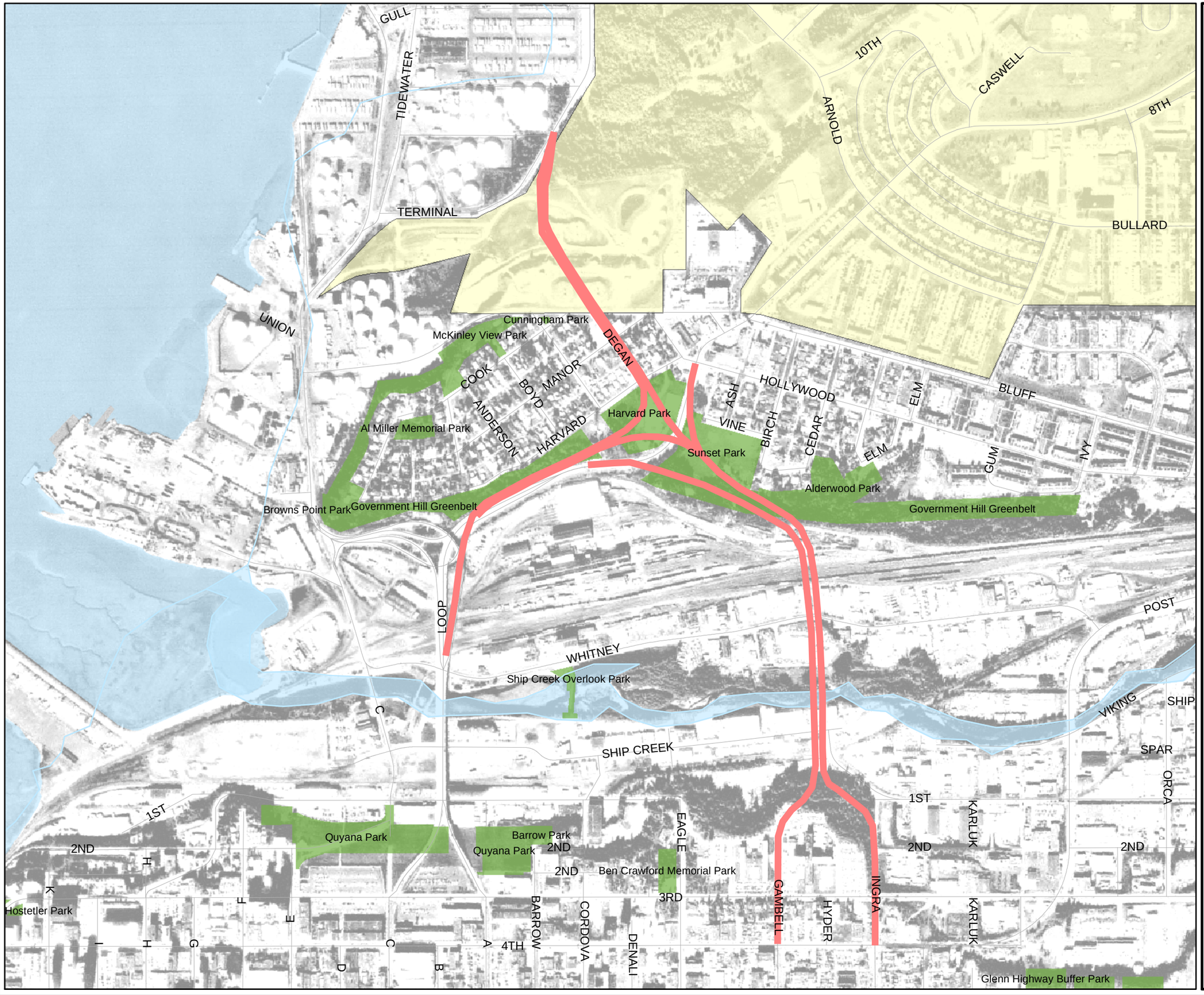
0.1 0.05 0 0.1 Miles

Knik Arm Crossing Engineering Feasibility and Cost Estimate Update

Ship Creek/Port Access Alignment Alternatives

(From the 1999 "MOA Ship Creek/
Port Access Alignment Alternatives" Report)

Figure 4.5



Legend

- Loop Road Alternative (1999)
- Rivers
- Roads
- Elmendorf Air Force Base
- Water Bodies, Rivers
- Municipality of Anchorage Parks

Data compiled by HDR Alaska, Inc.
September 2002

Source of data from:
Municipality of Anchorage,
Matanuska-Susitna Borough,
Department of Natural Resources,
USGS

Map is projected to Alaska Stateplane Zone 4,
NAD 27.

0.1 0.05 0 0.1 Miles

Knik Arm Crossing Engineering Feasibility and Cost Estimate Update

Ship Creek/Multi-Modal Alignment Alternatives

(From the 2000 "MOA Ship Creek/
Multi-Modal Transportation Plan
Alignment Alternatives" Report,
as amended by AMATS January 2001)

Figure 4.6

Legend

- Key Components of Multi-Modal Option
- Rivers
- Roads
- Elmendorf Air Force Base
- Water Bodies, Rivers
- Municipality of Anchorage Parks

Data compiled by HDR Alaska, Inc.
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Source of data from:
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Matanuska-Susitna Borough,
Department of Natural Resources,
USGS

Map is projected to Alaska Stateplane Zone 4,
NAD 27.

0.1 0.05 0 0.1 Miles

Knik Arm Crossing Engineering Feasibility and Cost Estimate Update

Hydric Soils, Topography and Water Bodies

Figure 4.7

Legend

Hydric Soils

- 15% or Less
- 15 to 50%
- 85% or More
- Contours (100 feet)
- Trails
- Railroad
- Roads
- Water Bodies, Rivers

Alignments

- Downtown I Crossing (1984)
- Bluff Project (1984)
- Elmendorf Crossing (1984)
- Houston Connector Segment 1 (1984)
- Houston Connector Segment 2 (1984)
- ADOT&PF Alignment Crossing (1972)
- Elmendorf AFB N-2 Crossing (1986)
- Elmendorf AFB West Crossing (1986)

Data compiled by HDR Alaska, Inc.
September 2002

Source of data from:
Municipality of Anchorage,
Matanuska-Susitna Borough,
Department of Natural Resources,
USGS

Map is projected to Alaska Stateplane Zone 4, NAD 27.

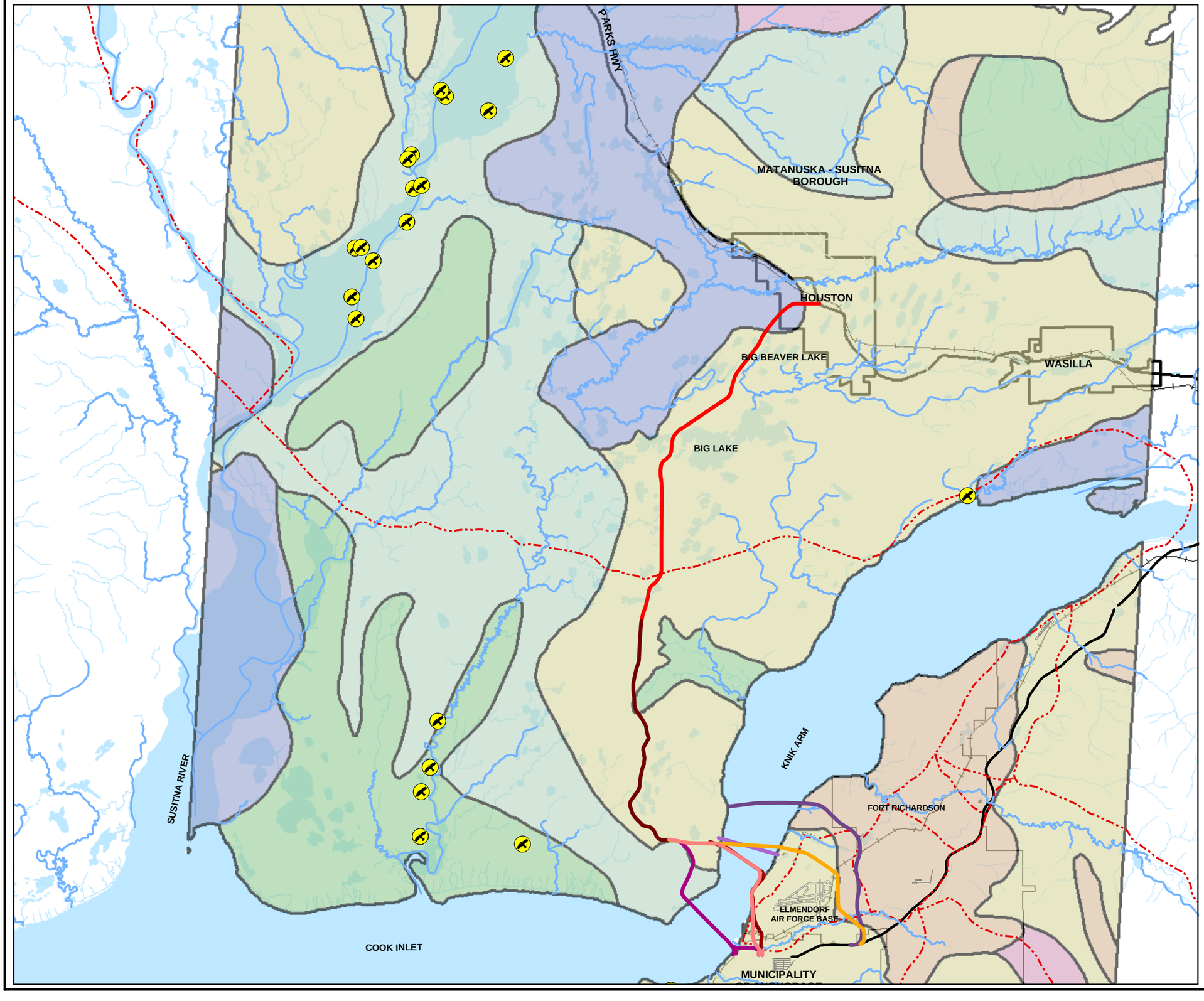
N
W
E
S

3 1.5 0 3 Miles

Knik Arm Crossing Engineering Feasibility and Cost Estimate Update

Wildlife Habitat
Moose and Eagle Nests

Figure 4.8



Legend

Moose Habitat

- *General*
- *Calving*
- *Calving, Winter*
- *Calving, Rutting, Winter*
- *Winter*
- *Winter, Rutting*

- Eagle Nest
- Anadromous Streams
- Trails
- Railroad
- City Limits

Alignments

- Downtown I Crossing (1984)
- Bluff Project (1984)
- EAFB/FR N-2 Corridor (1986)
- EAFB West-C Corridor (1986)
- Elmendorf Crossing (1984)
- Houston Connector Seg. 1 (1984)
- Houston Connector Seg. 2 (1984)
- ADOT&PF Alignment Crossing (1972)

Data Compiled by HDR Alaska, Inc.
September 2002

Source of data from:
Municipality of Anchorage,
Matanuska-Susitna Borough,
Department of Natural Resources,
USGS

Map is projected to Alaska Stateplane Zone 4, NAD 27.

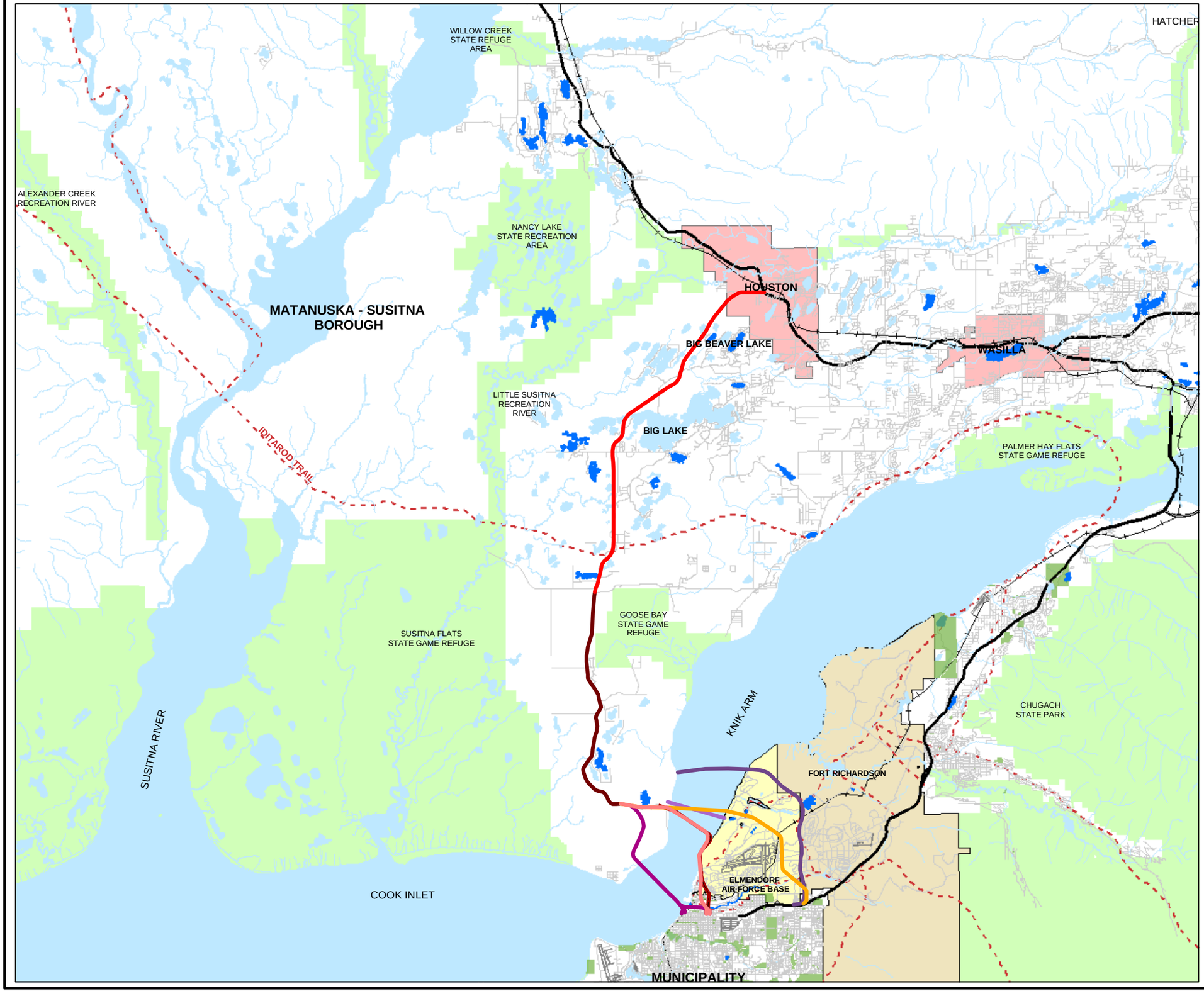
N W E S

3 1.5 0 3 Miles

Knik Arm Crossing Engineering Feasibility and Cost Estimate Update

Parks, Trails, and Refuges

Figure 4.9



Legend

Alignments

- Downtown I Crossing (1984)
- Bluff Project (1984)
- EAFB/FR N-2 Corridor (1986)
- EAFB West-C Corridor (1986)
- Refuges
- ADF&G Stocked Lakes
- Municipality of Anchorage Parks
- Trails
- Roads
- Railroad
- City Limits

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September 2002

Source of data from:
Municipality of Anchorage,
Matanuska-Susitna Borough,
Department of Natural Resources,
USGS

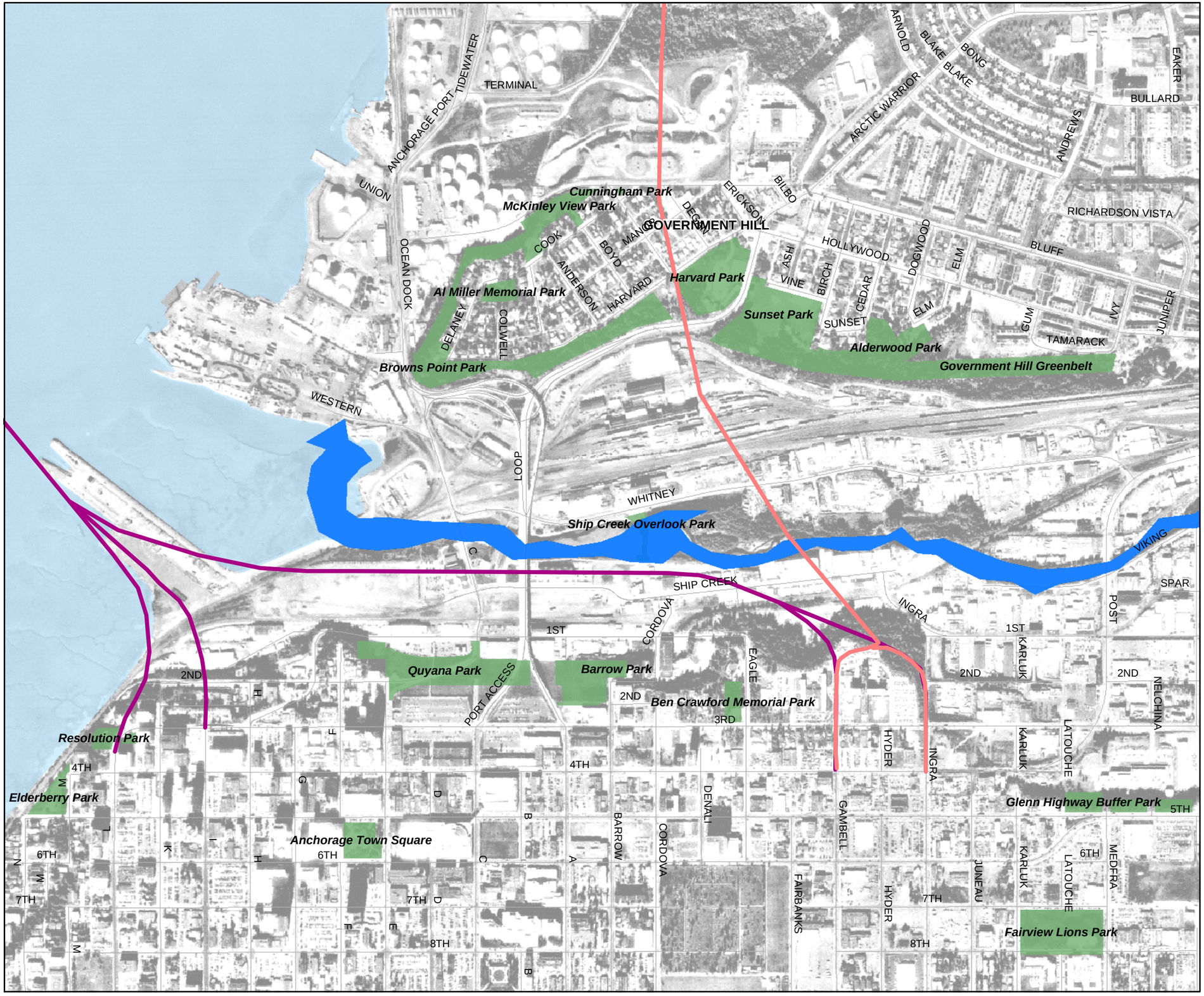
Map is projected to Alaska Stateplane Zone 4,
NAD 27.

2.5 1.25 0 2.5 Miles

Knik Arm Crossing Engineering Feasibility and Cost Estimate Update

Municipality of Anchorage, Alaska
Parks and Trails

Figure 4.10



Legend

- ADF&G Stocked Waterway
- Municipality of Anchorage Parks
- Anchorage Roads
- Water Bodies, Rivers

Alignments

- Downtown I Crossing (1984)
- Bluff Project (1984)

Data compiled by HDR Alaska, Inc.
September 2002

Source of data from:
Municipality of Anchorage,
Matanuska-Susitna Borough,
Department of Natural Resources,
USGS

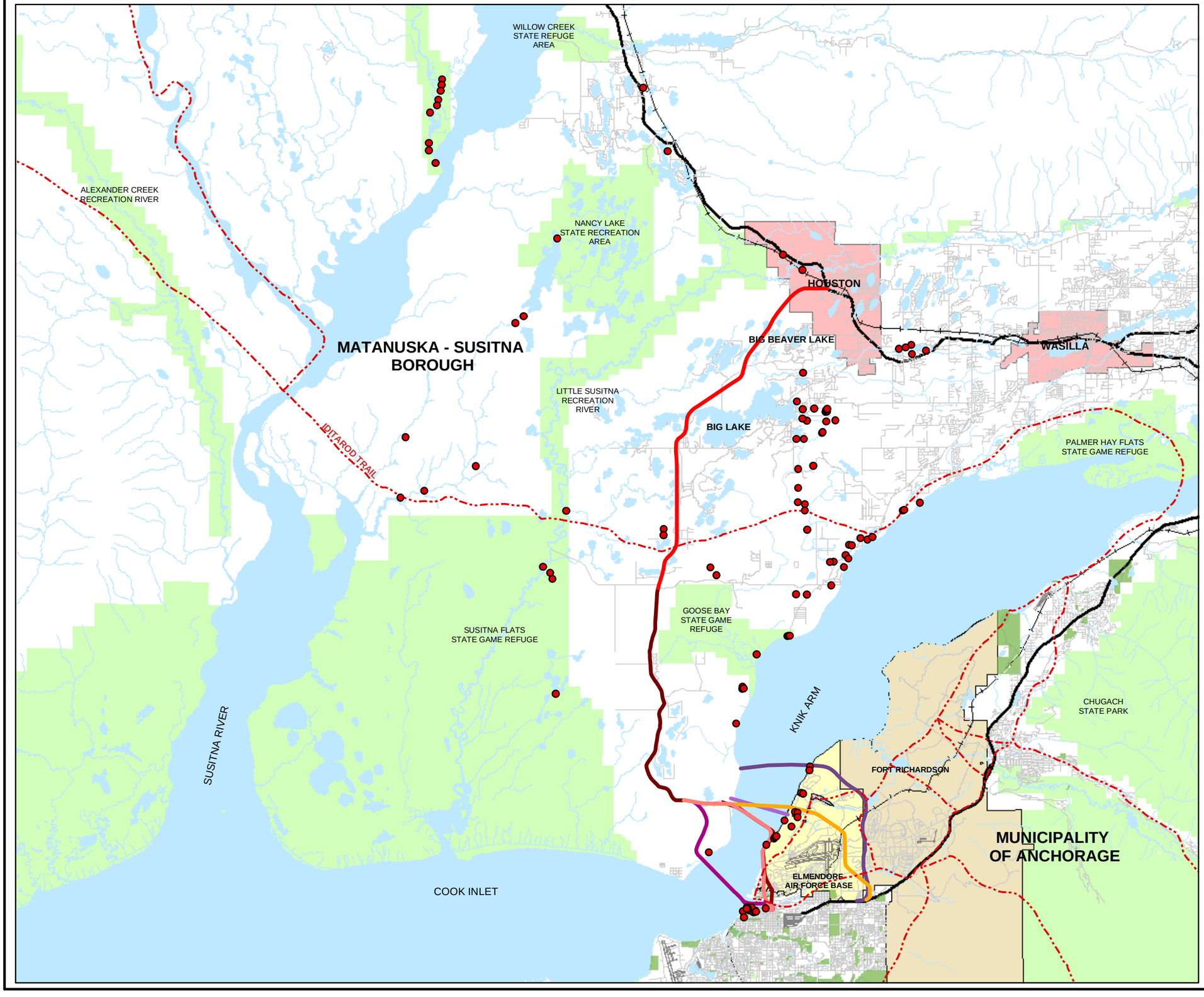
Map is projected to Alaska Stateplane Zone 4,
NAD 27.

0.1 0.05 0 0.1 Miles

Knik Arm Crossing Engineering Feasibility and Cost Estimate Update

Historic and Archaeologic Sites

Figure 4.11



Legend

- Historic/Archaeological Sites
- Trails

Alignments

- Downtown I Crossing (1984)
- Bluff Project (1984)
- EAFB/FR N-2 Corridor (1986)
- EAFB West-C Corridor (1986)
- Refuges
- Municipality of Anchorage Parks
- Roads
- Railroad
- City Limits

Data compiled by HDR Alaska, Inc.
September 2002

Source of data from:
Municipality of Anchorage,
Matanuska-Susitna Borough,
Department of Natural Resources,
USGS

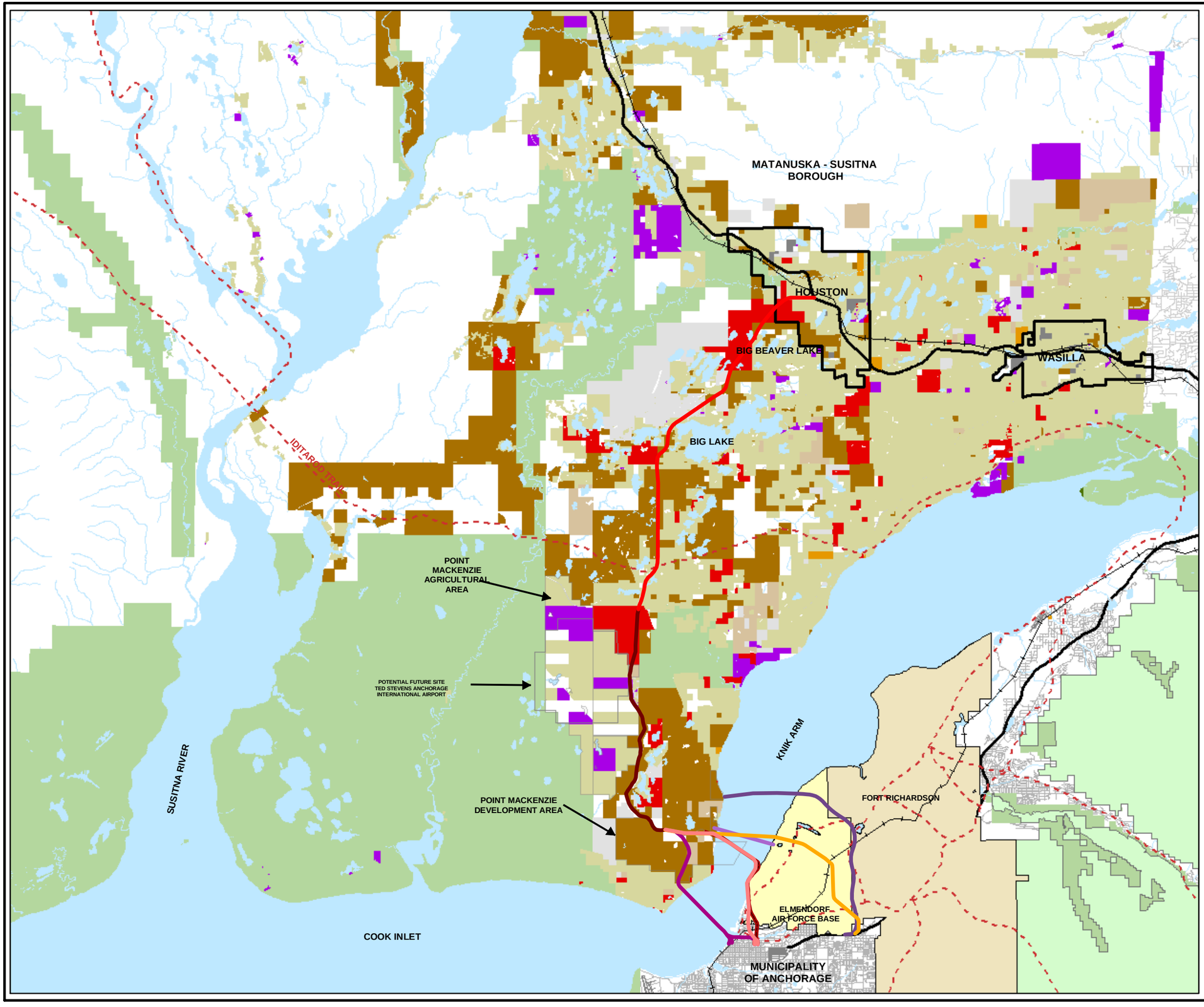
Map is projected to Alaska Stateplane Zone 4, NAD 27.

3 1.5 0 3 Miles

Knik Arm Crossing Engineering Feasibility and Cost Estimate Update

Land Ownership

Figure 4.12



Legend

- Water Bodies, Rivers

Land Ownership

- State
- Borough
- Native Corp
- Alaska Mental Health Land Trust
- City
- Private
- Public University
- CIRI
- BLM
- Department of Natural Resources Lands
- Ted Stevens Airport Expansion
- Point MacKenzie Agricultural Area
- Point Mackenzie Development Area
- City Limits

Alignments

- Downtown I Crossing (1984)
- Bluff Project (1984)
- EAFB/FR N-2 Corridor (1986)
- EAFB West-C Corridor (1986)
- Elmendorf Crossing (1984)
- Houston Connector Seg. 1 (1984)
- Houston Connector Seg. 2 (1984)
- ADOT&PF Alignment Crossing (1972)

Data compiled by HDR Alaska, Inc.
September 2002

Source of data from:
Municipality of Anchorage,
Matanuska-Susitna Borough,
Department of Natural Resources,
USGS

Map is projected to Alaska Stateplane Zone 4, NAD 27.

N W E S

0 1.5 3 6 Miles

Knik Arm Crossing Engineering Feasibility and Cost Estimate Update

Bathymetry

Figure 4.13

KNIK ARM

POINT MACKENZIE DEVELOPMENT AREA

ELMENDORF AIR FORCE BASE

FORT RICHARDSO

MUNICIPALITY OF ANCHORAGE

Legend

Depth (meters)

- 0
- 1 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- 25 - 30
- 30 - 35
- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- Trails
- Railroad
- Roads

Alignments

- Downtown I Crossing (1984)
- Bluff Project (1984)
- EAFB/FR N-2 Corridor (1986)
- EAFB West-C Corridor (1986)
- Elmendorf Crossing (1984)
- Houston Connector Seg. 1 (1984)
- Houston Connector Seg. 2 (1984)
- ADOT&PF Alignment Crossing (1972)
- Water Bodies, Rivers

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Source of data from:
Municipality of Anchorage,
Matanuska-Susitna Borough,
Department of Natural Resources,
USGS

Map is projected to Alaska Stateplane Zone 4, NAD 27.

N
W
E
S

1 0.5 0 1 Miles

Knik Arm Crossing Engineering Feasibility and Cost Estimate Update

Geology/Fault Lines

Figure 4.14

MATANUSKA - SUSITNA BOROUGH

HOUSTON

BIG BEAVER LAKE

WASILLA

BIG LAKE

GOOSE BAY STATE GAME REFUGE

SUSITNA RIVER

KNIK ARM

FORT RICHARDSON

MUNICIPALITY OF ANCHORAGE

ELMENDORF AIR FORCE BASE

COOK INLET

Legend

Alignments

- Downtown I Crossing (1984)
- Bluff Project (1984)
- EAFB/FR N-2 Corridor (1986)
- EAFB West-C Corridor (1986)
- Fault Line
- Castle Mountain Fault Line
- City Limits

Surficial Geology

- HOLOCENE FLOOD PLAINS, TERRACES, AND ALLUVIAL DEPOSITS
- IGNEOUS AND METAMORPHIC BEDROCK
- MORAINES AND OTHER UNSORTED GLACIAL DRIFT
- OUTWASH AND VALLEY TRAIN DEPOSITS
- PROGLACIAL LAKE AND ASSOCIATED FLUVIAL DEPOSITS
- SAND DUNES AND OTHER EOLIAN DEPOSITS
- SEDIMENTARY BEDROCK

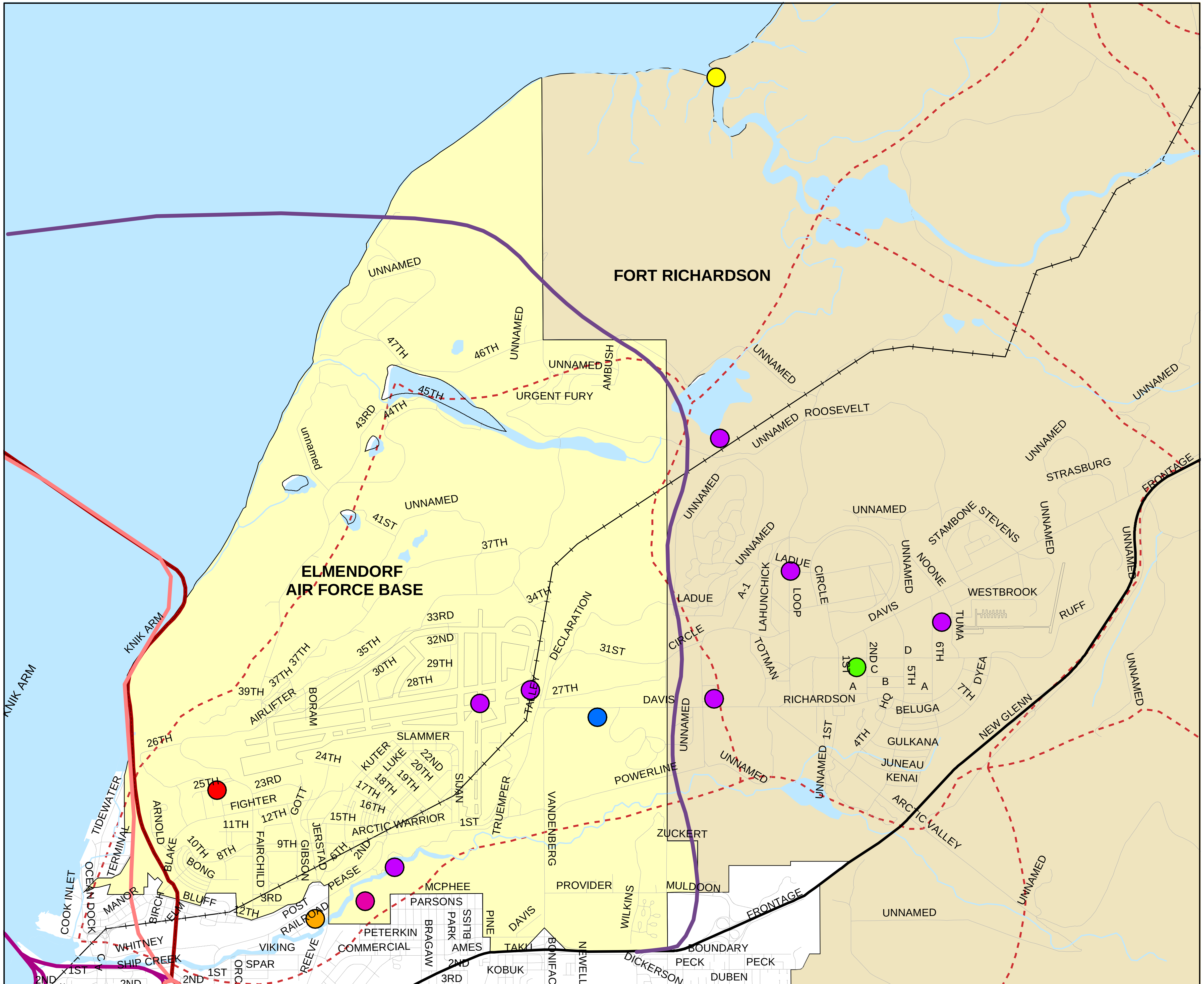
Data compiled by HDR Alaska, Inc.
September 2002

Source of data from:
Municipality of Anchorage,
Matanuska-Susitna Borough,
Department of Natural Resources,
USGS

Map is projected to Alaska Stateplane Zone 4, NAD 27.

N
W
E
S

2.5 1.25 0 2.5 Miles



Knik Arm Crossing Engineering Feasibility and Cost Estimate Update

Contaminated Areas on Superfund National Priority List

Figure 4.15

Legend

- Groundwater
- Soil
- Soil, Groundwater
- Soil, Sediment, Groundwater
- Soil, Sediment, Groundwater, Surface Water
- Soil, Surface Water
- Soil, Surface Water, Sludges
- Anchorage Roads
- Trails
- Railroad

Alignments

- Downtown I Crossing (1984)
- Bluff Project (1984)
- EAFB/FR N-2 Corridor (1986)
- EAFB West-C Corridor (1986)

Data compiled by HDR Alaska, Inc.
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Source of data from:
Municality of Anchorage,
Matanuska-Susitna Borough,
Department of Natural Resources,
USGS

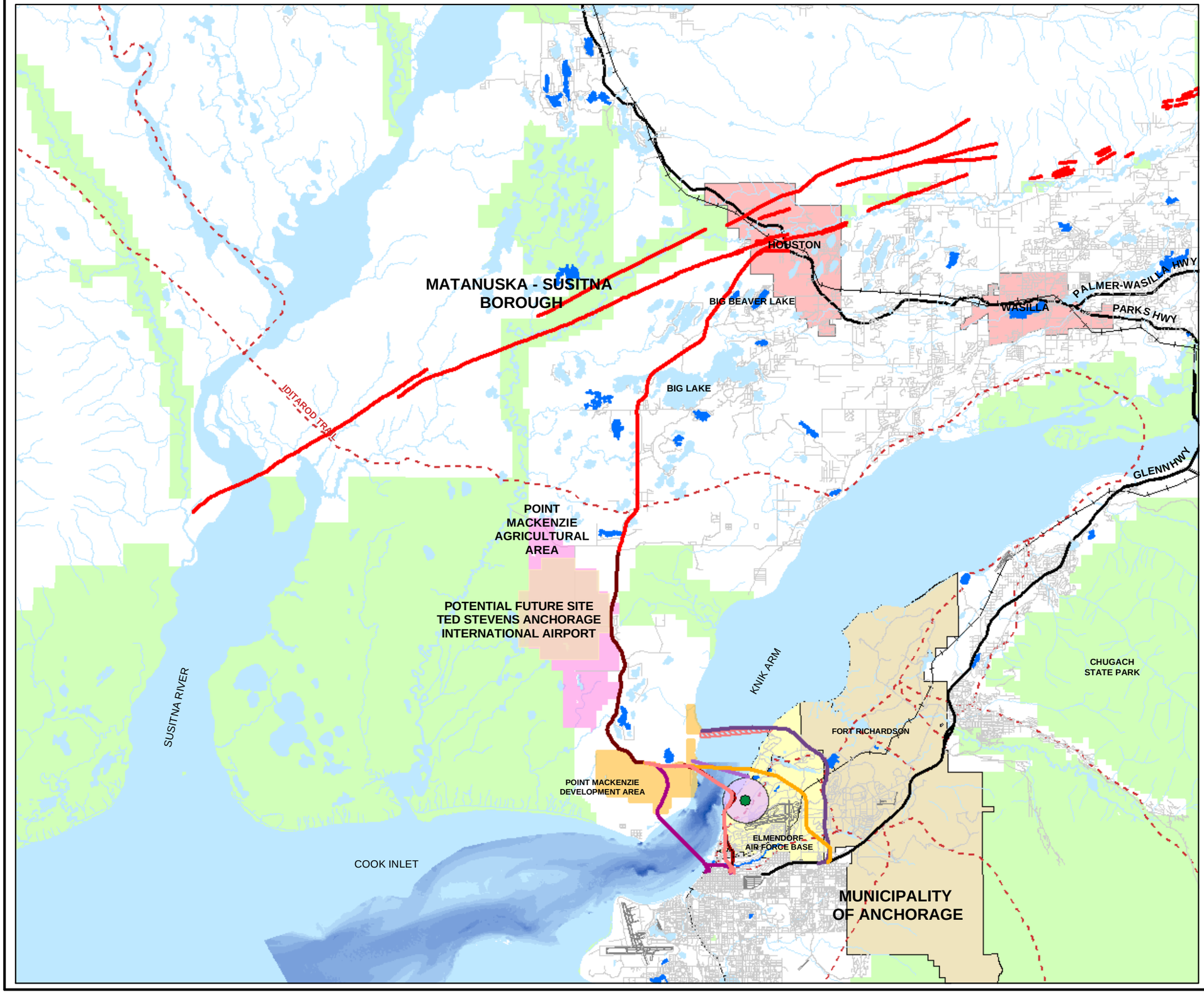
Map is projected to Alaska Stateplane Zone 4, NAD 27.

0.5 0.25 0 0.5 Miles

Knik Arm Crossing Engineering Feasibility and Cost Estimate Update

Composite Alignment Issues Map

Figure 4.16



Legend

Alignments

- Downtown I Crossing (1984)
- Bluff Project (1984)
- EAFB/FR N-2 Corridor (1986)
- EAFB West-C Corridor (1986)
- Elmendorf Crossing (1984)
- Houston Connector Seg. 1 (1984)
- Houston Connector Seg. 2 (1984)
- ADOT&PF Alignment Crossing (1972)
- Castle Mountain Fault Line
- Elmendorf Antenna Location
- ADF&G Stocked Lakes
- Trails
- Roads
- Railroad
- City Limits
- Chugach Electric Cable Field
- Refuges

Depth (meters)

- 0
- 1 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- 25 - 30
- 30 - 35
- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60

Data compiled by HDR Alaska, Inc.
September 2002

Source of data from:
Municipality of Anchorage,
Matanuska-Susitna Borough,
Department of Natural Resources,
USGS

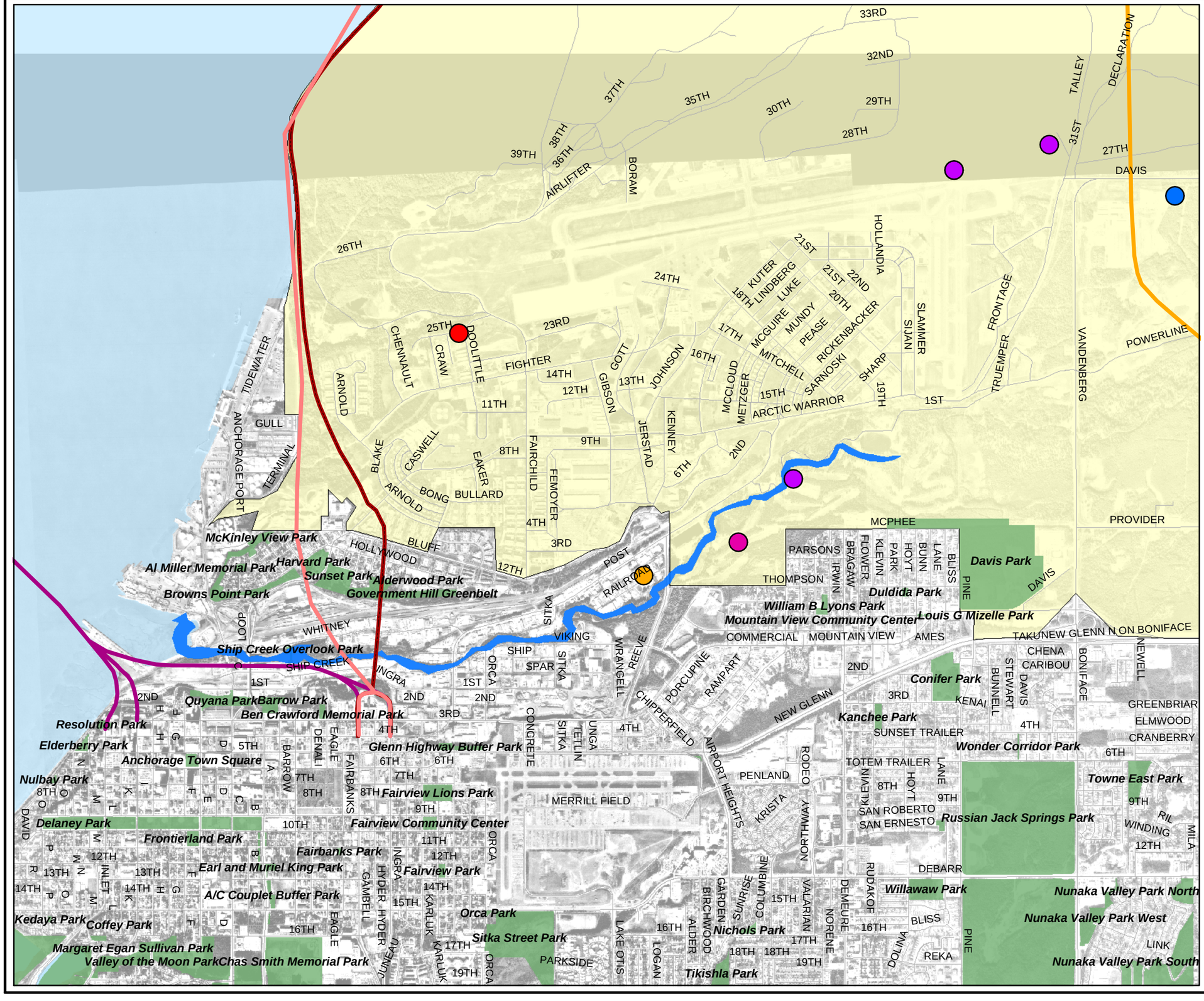
Map is projected to Alaska Stateplane Zone 4, NAD 27.

3 1.5 0 3 Miles

Knik Arm Crossing Engineering Feasibility and Cost Estimate Update

Composite Alignment Issues Map

Figure 4.17



Legend

- ADF&G Stocked Waterway
- Municipality of Anchorage Parks
- Anchorage Roads

Designation

- Elmendorf Air Force Base
- Fort Richardson Military
- Water Bodies, Rivers

Alignments

- Downtown I Crossing (1984)
- Bluff Project (1984)
- EAFB/FR N-2 Corridor (1986)
- EAFB West-C Corridor (1986)
- Elmendorf Crossing (1984)
- Houston Connector Seg. 1 (1984)
- Houston Connector Seg. 2 (1984)
- ADOT&PF Alignment Crossing (1972)

Contamination Type

- Groundwater
- Soil
- Soil, Groundwater
- Soil, Sediment, Groundwater, Surface Water
- Soil, Surface Water

Data compiled by HDR Alaska, Inc.
September 2002

Source of data from:
Municipality of Anchorage,
Matanuska-Susitna Borough,
Department of Natural Resources,
USGS

Map is projected to Alaska Stateplane Zone 4, NAD 27.

0.2 0.1 0 0.2 Miles

5.0 CORRIDOR TRAFFIC UPDATE

The purpose of this Corridor Traffic Update is to analyze the 1984 DEIS traffic, housing, and employment projections, compare projections to current information, study current forecasts, and present a range of potential traffic projections for the Knik Arm Crossing project. Generalized traffic volumes will be used as part of the preliminary implementation strategy and phasing for the Knik Arm Crossing project, as outlined in Volume 2 of this study; Technology Update.

5.1 Analysis

5.1.1 Assumptions

Following are the assumptions made as part of this corridor traffic update:

- All growth rate calculations are straight-line (non compound) rates.
- This update evaluates the projections made in the 1984 DEIS for the Downtown Crossing (mid-range) Alternative.
- Average Weekly Daily Traffic (AWDT) values will be used. No peak period reviews will be conducted.
- No assessment of operations or capacities will be conducted.

The Institute of Social and Economic Research (ISER) at the University of Alaska Anchorage published a report dated October 3, 2001, titled "Economic Projections for Alaska and the Southern Railbelt 2000-2025." This report is a comprehensive look at economic indicators for the State of Alaska and major population centers, including the Mat-Su Borough and Anchorage. Information from this report was used in the analysis for the corridor traffic update.

5.1.2 Employment

Employment forecasts presented in the 1984 DEIS for the 2001 No-Action Alternative have been compared to the actual growth in the Mat-Su Borough and Anchorage areas. The actual growth numbers have been obtained from U.S. Bureau of Census data through year 1999 and extrapolated to year 2001.

From 1983 to 2001, the DEIS projected that employment in the Mat-Su Borough and Anchorage area would grow annually at 9.6 percent and 2.9 percent, respectively. The actual growth during this period for the Mat-Su Borough was slightly lower than projected at 8.1 percent and for Anchorage was approximately 50 percent lower at 1.5 percent (Table 5-1). The combined regional growth rate projection for 2001 was 3.2 percent, compared with an actual rate of 1.8 percent.

Table 5-1. DEIS Forecast and Actual Employment, 1983 to 2001

	1983 (Actual)	2001 DEIS Forecast	1983 to 2001 DEIS Growth Rate	2001 (Actual)	1983 to 2001 Actual Growth Rate
Mat-Su	5,200	14,200	9.6%	12,770	8.1%
Anchorage	104,500	158,900	2.9%	132,369	1.5%
Both Locations	109,700	173,100	3.2%	145,139	1.8%
* Estimated from 1999 Census counts and 1990-1999 growth					

The DEIS also projected No-Action employment figures to the year 2010, as shown in Table 5-2. The 1983 to 2010 forecasts are similar to the 1983 to 2001 rates, with slightly higher annual growth for the Mat-Su Borough at 10.5 percent and slightly lower projected rates for Anchorage at 2.7 percent.

Table 5-2. DEIS Employment Forecast, 1983 to 2010

DEIS Employment Forecasts			
	1983	2010 DEIS Forecast	Annual Growth Rate
Mat-Su	5,200	19,900	10.5%
Anchorage	104,500	180,500	2.7%
Both Locations	109,700	200,400	3.1%

Because the DEIS forecasts are almost 20 years old, current forecasts were reviewed. In the ISER report, "Economic Projections for Alaska and the Southern Railbelt 2000-2025," the forecasts for employment have similar "ratios" of Mat-Su to Anchorage growth, as shown in Table 5-3. However, a comparison of ISER forecasts indicate that the annual actual growth rates are lower than both the DEIS and historical values.

Table 5-3. ISER Employment Forecast 2000 to 2025

	2000 (Actual)	2025 ISER Forecast	Annual Growth Rate
Mat-Su	12,000	24,200	4.1%
Anchorage	131,500	172,600	1.3%
Both Locations	143,500	196,800	1.5%

In summary, the DEIS projected employment growth higher than what actually occurred from 1983 to 2000. The DEIS employment growth rates to year 2010 are higher than the growth rates developed by ISER. The historical and projected ISER growth rates are similar for Anchorage. The historical growth rates for Mat-Su are higher than the ISER projections.

5.1.3 Housing

The housing forecasts presented in the DEIS for the 2001 No-Action Alternative have also been compared to the growth actually realized in the Mat-Su Borough and Anchorage area. Again, the actual growth numbers have been obtained from U.S. Census data through year 1999 and extrapolated to year 2001.

From 1983 to 2001, the DEIS projected housing to grow in the Mat-Su Borough at 8.6 percent annually, as shown in Table 5-4. Anchorage housing was forecast to grow at 3.4 percent annually. The actual growth rates for this time period were lower than projections, especially for the Anchorage area.

Table 5-4. Forecast and Actual Housing, 1983 to 2001

	1983 (Actual)	2001 DEIS Forecast	1983 to 2001 DEIS Growth Rate	2001 (Actual)	1983 to 2001 Actual Growth Rate
Mat-Su	9,800	24,900	8.6%	21,272	6.5%
Anchorage	77,900	126,000	3.4%	96,034	1.3%
Both Locations	87,700	150,900	4.0%	117,306	1.9%
* Estimated from 1999 Census counts and 1990-1999 growth					

The DEIS also projected No-Action housing growth rates for 1983 to 2010, as shown in Table 5-5. For both the Mat-Su Borough and Anchorage area, the 1983 to 2010 rates are higher than the 1983 to 2001 rates.

Table 5-5. DEIS Housing Forecasts, 1983 to 2010

DEIS Housing Forecasts			
	1983	2010	Annual Growth Rate
Mat-Su	9,800	37,000	10.3%
Anchorage	77,900	210,000	6.3%
Both Locations	87,700	247,000	6.7%

For both areas between 1983 and 2010, the annual housing growth rate was projected to increase 6.7 percent annually.

ISER also projected housing forecasts from 2000 to 2025, as shown in Table 5-6. These forecasts are lower than the DEIS values for the Mat-Su Borough and Anchorage area and lower than the historical trends for the Mat-Su Borough.

Table 5-6. ISER Housing Forecasts, 2000 to 2025

	2000 (Actual)	2025 ISER Forecast	Annual Growth Rate
Mat-Su	20,500	45,000	4.8%
Anchorage	94,800	134,900	1.7%
Both Locations	115,300	179,900	2.2%

In summary, the DEIS projected housing growth higher than what actually occurred from 1983 to 2000. The DEIS housing growth rates to year 2010 are higher than the growth rates developed by ISER. The historical growth rates are relatively close to the ISER projections.

5.1.4 Traffic

Four screenline traffic locations were selected to compare historical traffic volumes and those projected in the 1984 DEIS. These key arterials were selected based on the geographic location and potential volume change associated with a new crossing of Knik Arm. The screenline locations are as follows:

- Glenn Highway between Eagle River and Peters Creek

- Parks Highway north of the Glenn Highway
- Ingra-Gambell at Chester Creek
- Glenn Highway—Bragaw Street to Boniface Parkway

On average, the traffic volume forecasts in the DEIS for the No-Action Alternative in year 2001 were higher than actual observations, as shown in Table 5-7. (Average Daily Traffic [ADT] numbers in the ADOT&PF "2001 Annual Traffic Volume Report" were converted to AWDT for comparison purposes with the 1984 DEIS.)

Table 5-7. 1982 to 2001 Traffic Forecasts

	1982 (Actual)	2001 DEIS Forecast*	1982 to 2001 DEIS Growth Rate*	2001 (Actual)	1983 to 2001 Actual Growth Rate
Glenn Highway - Eagle River to Peters Creek	16,000	47,600	10.4%	23,100	2.3%
Parks Highway north of Glenn Highway	8,500	20,200	7.2%	19,300	6.7%
Ingra-Gambell at Chester Creek	49,445	70,300	2.2%	53,000	0.4%
Glenn Highway - Bragaw to Boniface	34,500	54,200	3.0%	42,500	1.2%
* No-Action Alternative					

The 1982 to 2001 growth rates from the 1984 DEIS No-Action Alternative ranged from 2.2% to 10.4% annually. The actual historical counts ranged from 0.4% to 6.7% annually. The Parks Highway north of the Glenn Highway was the only location where DEIS forecasts were close to actual counts.

Table 5-8 shows the year 2010 No-Action Alternative forecasts from the 1984 DEIS.

Table 5-8. 2001 to 2010 DEIS Traffic Forecasts

DEIS AWDT Forecasts	2001	2010*	2001 to 2010 DEIS Growth Rate*
Glenn Highway - Eagle River to Peters Creek	47,600	59,600	2.8%
Parks Highway north of Glenn Highway	20,200	27,100	3.8%
Ingra-Gambell at Chester Creek	70,300	82,300	1.9%
Glenn Highway - Bragaw to Boniface	54,200	67,200	2.7%
*No-Action Alternative			

The 2001 to 2010 traffic forecasts from the 1984 DEIS No-Action Alternative had growth rates at the screenline locations ranging from 1.9% to 3.8% annually.

The 1984 DEIS also projected traffic diversion associated with the Downtown Crossing Alternative. The projections shown in Table 5-9 with the Downtown Crossing Alternative indicate a significant reduction in traffic on both the Glenn Highway and Parks Highway screenlines. An increase in traffic was projected on the Ingra-Gambell system due to the proximity of the eastern terminus of the crossing. The actual Knik Arm Crossing was projected to carry 42,300 trips per day in 2010.

Table 5-9. 2010 Volumes From DEIS (Downtown Project)

	No-Action 2010	Downtown Project Diversion Volume	2010 Downtown Project Volume After Diversion
Downtown Crossing		42,300	42,300
Glenn Highway - Eagle River to Peters Creek	59,600	-21,100	38,500
Parks Highway north of Glenn Highway	27,100	-15,500	11,600
Ingra-Gambell at Chester Creek	82,300	11,800	94,100

Two other sets of traffic forecasts have been develop to for year 2010 based on historical trends and ISER. Each of these forecasts includes a No-Action and With Crossing Alternative. The No-Action Alternatives project 2010 volumes based on the growth rates. The With Crossing Alternatives project 2010 volumes assuming a new downtown crossing is in place. The With Crossing Alternative traffic volumes are based on the diversion ratios used in the 1984 DEIS.

Table 5-10 shows the projected 2010 No-Action, diversion and Knik Arm Crossing volumes based on historical growth patterns.

Table 5-10. 2010 Volumes Based On Historical Growth Rates

	2010 No-Action Volume	With Crossing Diversion Volume	2010 With Crossing Volume After Diversion
Knik Arm Crossing		28,300	28,300
Glenn Highway - Eagle River to Peters Creek	28,200	-10,000	18,200
Parks Highway - West of Glenn	31,600	-18,100	13,500
Ingra-Gambell at Chester Creek	54,900	7,900	62,800

The 2010 No-Action volumes based on historical growth show the Parks Highway, west of the Glenn has comparable traffic numbers to the 1984 DEIS forecasts at that location. The Crossing would divert a significant amount of traffic from this location and the Glenn Highway.

Table 5-11 shows the projected 2010 No-Action, diversion and Knik Arm Crossing volumes based on ISER growth patterns. The ISER average rates for the Mat-Su Borough and Anchorage area were applied to the screenline locations to project 2010 volumes. For the Glenn Highway, Eagle River to Peters Creek, and Parks Highway west of the Glenn Highway locations, the Mat-Su Borough rate was applied, and for the Ingra-Gambell at Chester Creek location, the Anchorage rate was applied.

Table 5-11. 2010 Volumes Based On ISER Growth Rates

	2010 No-Action Volume	With Crossing Diversion Volume	2010 With Crossing Volume After Diversion
Knik Arm Crossing		29,900	29,900
Glenn Highway - Eagle River to Peters Creek	32,500	-11,500	21,000
Parks Highway - West of Glenn	27,100	-15,500	11,600
Ingra-Gambell at Chester Creek	60,200	8,600	68,800

The ISER 2010 No Action projections also show comparable numbers to the 1984 DEIS at the Parks Highway, west of the Glenn.

The historical and ISER projections both show comparable 2010 volumes for the No-Action and with Crossing scenarios. The ISER volumes are slightly higher than the historical trend volumes.

Knik Arm Crossing traffic projections out to the year 2050 can also be estimated from continuation of the DEIS projections, historical trends and the ISER data as an indication of "order of magnitude" future conditions. Consistent with the 2010 results at the screenline locations, the DEIS forecasts show the highest AWDT traffic for year 2050 at 74,200. The historical trends show 42,200 vehicles for use of a Crossing and the ISER projections show 51,000. All of these projections for the crossing are consistent with a four-lane highway crossing. A four-lane highway can typically accommodate AWDT of 70,000 to 80,000. A two-lane facility would not meet the demand. A six-lane facility would have significant unused capacity in year 2050.

All Crossing forecasts do not directly account for transit or use of nonsingle-occupancy vehicles. They assume that no increases in existing high-occupancy vehicle percentages would take place. If dedicated transit service facilities are part of a Crossing project, the vehicular traffic volumes would be slightly lower.

5.1.5 Freight

In the 1984 DEIS, freight forecasts were developed for each network alternative. Total tonnage estimates of freight flowing through the study area were developed and distributed to destinations inside and outside the study area and then split between rail and truck modes. Modal splits were assumed to not be affected by changes in the network. Volumes were assigned to rail and truck links based on the shortest travel times between origins and destinations for each of the alternative networks. These freight forecasts were then used to generate measures that could be used to forecast operational cost savings. Numerous scenarios involving rail and truck commodity type, year, mode and link were developed and evaluated for various network alternatives.

In summary, the freight forecasts in the 1984 DEIS indicated the following:

- The percentage of rail tonnage carried within the study area that would use a Crossing steadily increases from 36 percent in 1990 to 49 percent in 2030.
- On the basis of both truck ton-miles traveled and truck vehicle-miles traveled, a significant benefit would be realized for truck movement between Anchorage and points north with a Crossing.
- A greater benefit for truck freight movement would be realized from a Downtown Project than from an Elmendorf Project.

A significant variable in the evaluation of freight movement that would use a Knik Arm Crossing depends on what type of port is developed at Port MacKenzie. Traffic originating or destined for the Interior that passes through Port MacKenzie may not use a Crossing, and this traffic

represents a substantial portion of traffic that would otherwise use it. On the other hand, traffic destined for Anchorage arriving at Port MacKenzie would use a Crossing. This tonnage eventually could be substantial if Port MacKenzie were to handle all additional container traffic above the capacity of the POA.

In June 2001, the MOA studied the physical and regulatory needs of the freight industry to promote reliable and cost-effective means to circulate freight within the city and to other destinations served by the city as a hub. The report, "Freight Mobility Study," identified four general recommendations in the project area:

- Improve access connections between the POA and the Ship Creek warehouse district and the remainder of Anchorage
- Improve roads within the Ship Creek basin that are key to movement of freight, including upgrades to width, surface, and sight distance
- Improve connections and mobility between the Seward Highway and the Glenn Highway
- Explore and investigate the need for a consolidated freight terminal in the Ship Creek area in conjunction with the ARRC trailer-on-flat-car facility, relocation of Whitney Avenue, and the alternative Ingra-Gambell route

5.2 Corridor Traffic Update Summary

In the 1984 DEIS, aggressive rates of growth in the MOA and the Mat-Su Borough were predicted up to year 2010 in traffic, employment, and housing. The Mat-Su Borough was predicted to have higher rates of growth than Anchorage because of the increase in employment within the two areas and relatively better home values in the Mat-Su Borough. The housing and employment forecasts in the DEIS were higher than what actually occurred and higher than current projections developed by ISER.

Analysis reveals several significant findings related to the traffic projections:

1. The traffic projections provided in the 1984 DEIS are higher than the actual traffic growth at several screenline locations for years 1983 to 2001.
2. 2010 volume projections based on ISER forecasts are comparable to 2010 projections based on historical trends.
3. Estimated 2050 projections for the crossing using the DEIS, historical trends, and ISER information all support a four-lane crossing versus two or six lanes.
4. The DEIS, historical trends, and ISER forecasts all show the need for future network improvements throughout the area with or without the crossing.
5. Traditional four-step modeling will be needed to accurately assess future traffic conditions associated with a new crossing.
6. A detailed traffic analysis will be necessary to determine traffic patterns, facility operations, and transportation impacts.

6.0 ROUTE ALIGNMENT UPDATE (HYBRID ALIGNMENT)

The purpose of this update of the route alignments is to discuss the rationale used to determine a Knik Arm Crossing alignment that meets the project purpose and need objectives and can be used as a basis for developing an opinion of cost that represents the probable range of costs for a Crossing project. This update also is intended to provide a general description of the components of this representative alignment. This study does not, however, attempt to identify a preferred alternative. On the basis of the review of historical Knik Arm Crossing documents and research of physical changes, land uses, new technologies, and issues and concerns, a general alignment was identified—the Hybrid Alignment—for use in evaluating order-of-magnitude cost estimates that would represent approximate funding needs for programming of future project work. Volume 2 of this study details engineering features, and Volume 3 presents updated cost estimates, schedule, financing, and maintenance and operation for the Hybrid Alignment.

6.1 Hybrid Route Alignment Evaluation

In order to determine an alignment that best approximates order of magnitude probable costs for a Knik Arm Crossing, the project was evaluated by segments consisting of the South Approach, a crossing of the Knik Arm, and the North Approach. In addition, the Hybrid Alignment for a Knik Arm Crossing bridge alternative assumes a railroad connection from the Port of Anchorage and is inclusive of the project along the Bluff Route and across the Knik Arm bridge crossing structure. Once on the Mat-Su Borough side, the railroad would become independent of the North Approach.

6.1.1 South Approach

For the South Approach, previously studied alignments indicate that either the Downtown/Bluff route or the Elmendorf route offer the best candidate alignment alternatives.

Downtown/Bluff Route

A Downtown route offers several distinct advantages, including the following:

- High cost-effectiveness
- Best meets the transportation and development objectives of the Anchorage and Mat-Su area, as identified by the project purpose and need objectives
- Provides the greatest shift in urban growth to the Mat-Su Borough
- Results in the highest diversion of traffic to a Knik Arm Crossing

The results of the "Alignment Issues Update Technical Memorandum," which was prepared in conjunction with this Update Project, indicated that a Downtown Crossing alternative for the south approach should consider updated alignment evaluations with components from the 1985 ADOT&PF Bluff Project and the 1999-2000 MOA POA and Ship Creek transportation alignment studies. The Bluff route was evaluated as part of the "Knik Arm Crossing Final Corridor Alternatives Analysis" report, dated December 5, 1983, and then further studied as part of the "Knik Arm Crossing Implementation Options, Volume 2," dated February 28, 1985. The Bluff route begins in Downtown Anchorage at 3rd Avenue and the Ingra-Gambell couplet and follows the bluff on the east side of Knik Arm to approximately the location of the Elmendorf

route, where it crossed Knik Arm. The route transitions from the existing Ingra-Gambell couplet with a 3,000-foot bridge extension across Ship Creek to Loop Road on the north bluff. It includes a below-grade roadway through a portion of the Government Hill neighborhood, an at-grade roadway along the property line between Elmendorf AFB and the POA, and a shoreline roadway along Knik Arm to north of Cairn Point. From Downtown Anchorage to Lake Lorraine in the Mat-Su Borough, the Downtown Bluff route is approximately 8 miles in length, compared with 18 miles for the Elmendorf route, providing significant improvement to transportation goals and objectives. The primary issues of this alignment are impacts to the Government Hill community and the location of the route within the one-mile highway clear zone of the Elmendorf CDAA. The route could not be located outside the one-mile antenna clear zone without substantially increasing bridge costs due to water depths and poor geophysical conditions directly across from or south of the Cairn Point vicinity. A tunnel or bridge and tunnel hybrid alternative that provides electromagnetic shielding could potentially be less intrusive to military functions and operations in the vicinity of the CDAA. From a financial standpoint (excluding CDAA relocation costs estimated at $400 M in 1985 dollars), however, this alternative would achieve the objective of the most efficient distribution of traffic with the least total project cost ($648 M in 1985 dollars).

Elmendorf Route

The 1984 DEIS and subsequent cost analysis, documented in "Knik Arm Crossing Implementation Options, Volume 1" (February 28, 1985), determined that the Elmendorf route, at a cost of $698 M (1985 dollars), was optimal in comparison to the Downtown I route (suspension bridge with a direct connection into Downtown Anchorage), with an estimated cost of $1,107 M (1985 dollars). If the Downtown/Bluff route could be accomplished, however, it would likely result in a better cost-effectiveness ratio in relation to the Elmendorf route due to a higher traffic diversion onto the facility. A primary disadvantage of the Elmendorf route is that it would not provide a POA connection to the north for freight and goods movement. The Elmendorf route begins at an interchange with the Glenn Highway near Muldoon Road in Anchorage and included a 6.5-mile crossing through Elmendorf AFB to Knik Arm. After the 1984 DEIS studies, the Department of the Air Force undertook a more detailed evaluation of this alignment in 1986 and concluded that a more optimal route generally followed the Elmendorf AFB and Fort Richardson Army Base boundary north from Muldoon Road to Knik Arm. At this time, it is uncertain how new security measures may affect these previously studied military land alignments. Alignments and security measures will need to be looked at in detail before conclusions can be drawn, but in general, a heightened military mission for both Elmendorf AFB and Fort Richardson will impose complexities for any alignment alternative within or in the proximity of these military installations.

Alternative Cost Considerations

Therefore, to estimate the probable costs for a south approach to a Knik Arm crossing that would meet the project purpose and need objectives and account for a representative cost range, a Downtown connector with components from the 1985 ADOT&PF Bluff Project and the MOA POA and Ship Creek transportation alignment studies was identified for updated cost analysis. Viable alignment alternatives for the south approach that will be studied in future EIS evaluations, including reevaluation of the Elmendorf AFB/Fort Richardson route, should be comparable to the estimated cost range for the Downtown/Bluff route.

6.1.2 Crossing Location

The key alignment issues for a crossing of Knik Arm involve water depths, crossing length, and the geotechnical and geophysical conditions of Knik Arm. Potentially viable crossing alternatives consist of a bridge structure, a tunnel, and a combination bridge and tunnel. To "book-end" the probable costs for a crossing of Knik Arm, both a bridge alternative and a tunnel alternative were selected for updated cost analysis. The crossing alignment for this updated cost analysis is located in the proximity of both the Elmendorf route crossing and the preferred crossing location identified in the Alaska Department of Highways "Knik Arm Highway Crossing Study" (1972). This alignment location, approximately 1.7 miles north of Cairn Point on the east side of Knik Arm and connecting into the existing Point MacKenzie Access Road near Port MacKenzie on the west side, has a maximum water depth of approximately 70 feet. The crossing length is approximately 2.65 miles at this location.

Northward of this location, an alignment would offer no distinct advantage due to no significant decrease in water depth, but would require a considerably longer crossing. A southward shift would decrease the crossing length, but would place the crossing over substantially deeper water and significantly increase crossing costs.

6.1.3 North Approach

For the north approach, the preferred alternative from the 1984 DEIS, identified as the Houston Connector, has been selected as the general alignment for use in updating estimated costs. Both the Downtown Alternative and the Elmendorf Alternative, which were recommended alignment alternatives from the 1984 DEIS, incorporated the Houston Connector as a common alignment connector in the Mat-Su Borough. The Houston Connector, approximately 28.7 miles in length, included the following:

- Segment 1 (Ayrshire Road Segment): an 11.7-mile, limited-access roadway from the Crossing to the east-west segment of the Point MacKenzie Access Road
- Segment 2 (North Segment): a 17-mile, limited-access roadway from the east-west segment of Point MacKenzie Access Road north to the Parks Highway at the City of Houston

The rationale for selecting the Houston Connector alignment for cost updating is primarily that it is representative of the cost for a corridor through this area of the Mat-Su Borough. Overall, the total cost for the north approach based on the 1984-1985 DEIS reports was estimated at $75.5 M (1985 dollars). Therefore, updated cost estimates for this alignment in relation to future alignment reevaluations should not constitute a significant cost variance in the context of total project costs if adjustments need to be made.

The Ayrshire Road Segment, which basically consists of the existing alignment of the Point MacKenzie Access Road, is likely to remain the general preferred alternative location in future EIS evaluations. On the southern end of this segment, the Point MacKenzie Development Area and Port MacKenzie have been planned around this existing roadway alignment. The northern end of this segment is largely controlled by water bodies and wetlands, the Point MacKenzie Agricultural Area, and the Goose Bay State Game Refuge. Ayrshire Road is close to this portion of the Hybrid Alignment.

The North Segment may likely require the study of additional alignment routings during future EIS evaluations. The Mat-Su Borough is currently evaluating alternative rail and highway alignment connectors from Port MacKenzie to the Parks Highway, and any future Knik Arm Crossing connectors would likely build on these alignment studies. Development has intensified in the Big Lake area since the 1984 DEIS, and alignment revisions will need to be fully evaluated. Because future potential alignment revisions in this segment would represent a relatively minor total cost percentage of the Knik Arm Crossing project, this alignment should represent an adequate order-of-magnitude cost estimate until future alignment evaluations are conducted. Furthermore, because this alignment includes a substantial bridge structure between Big Lake and Mirror Lake that may not be required with a revised alignment routing, the estimate provides a cost buffer to accommodate future adjustments in alignments.

6.2 Hybrid Alignment Identification

The route alignment identified for the update of project costs, referred to as the Hybrid Alignment, will provide probable cost estimates to represent approximate funding needs for programming of future project work. The Hybrid Alignment is shown in **Figure 6.1** *(Hybrid Alignment Location Map)* and includes the following:

- **South Approach:** a combination alignment of the ADOT&PF Bluff Project and the MOA POA and Ship Creek transportation alignment studies, from 3rd Avenue in Downtown Anchorage at Ingra-Gambell streets to the POA
- **Knik Arm Crossing:** a bluff alignment location from the POA to approximately 1.7 miles north of Cairn Point on the east side of Knik Arm and aligning with the Point MacKenzie Access Road near Port MacKenzie on the west end in the Mat-Su Borough, including both a bridge and a tunnel cost estimate for crossing Knik Arm
- **North Approach:** the Houston Connector, based on the 1984 DEIS recommended alignment.

6.2.1 Design Parameters

To update and refine project costs for the selected Hybrid Alignment, preliminary design parameters were assembled for basic engineering components for the south approach and north approach segments to the Knik Arm crossing. Preliminary design components for the Knik Arm crossing segment, including a major bridge structure and tunnel alternative, are discussed in Volume 2. The preliminary design criteria and assumptions for the south approach and the north approach are shown in Table 6-1.

Table 6-1. Preliminary Design Criteria

Project Detail	Knik Arm Crossing Design Criteria Assumptions
Functional Classification	Urban/Rural Principal Arterial/Interstate
Design Vehicle	WB-15 (PGDHS p17)
Terrain Classification	Urban Section: Rolling, Rural Section: Level (PGDHS p235)
Design Speed (mph)	Urban: 55, Rural: 70 [PCM 1120.02(2)]
Stopping Sight Distance (ft)	Urban: 495, Rural: 730 (PGDHS p112)
Passing Sight Distance (ft)	Urban: 1,985, Rural: 2,480 (PGDHS p124)
Maximum Allowable Grade (%)	Urban: 5, Rural: 3 (PGDHS p510)
Minimum Allowable Grade (%)	0 (PGDHS p242)
Minimum Allowable Radius of Curvature (ft)	Urban: 835, Rural: 2050 (PGDHS p145, e=6%)
Minimum k-value for Vertical Curves (crest)	Urban: 1407, Rural: 2197 (PGDHS p276)
Minimum k-value for Vertical Curves (sag)	Urban: 115, Rural: 181 (PGDHS p 280)
Number of Roadways	1
Total Lane and Shoulder Width (ft)	Urban: 88, Rural: 76 [PCM 1120.02(3)]
Surface Treatment	Asphalt Concrete Pavement
Side Slope Ratios Foreslopes	Urban: 23 ft (7m) @1V:4H, Rural: 30 ft (9m) @1V:4H (PCM Table 1130-8)
Median Treatment	Urban: Rigid Concrete, Rural: N/A
Illumination	South Approach and Bridge Crossing

The vertical datum used to reference project elevations is MOA 1972, based on NOAA tidal data of 11/03/99 observed at Station 9455920, located near the Port of Anchorage. The zero point of this datum is approximately equal to the local value of mean sea level (MSL) at Station 9455920. Project elevations match elevations referenced on existing planimetric mapping for MOA, Elmendorf Air Force Base and the Matanuska-Susitna Borough. Table 6-2 indicates the project elevation values of NOAA datum.

Table 6-2. Tidal Datum Elevations

Tidal Reference	NOAA Elevation (ft.)	MOA 1972 Elevation (ft.)
Highest observed water	+34.6	17.3
Mean higher high water (MHHW)	+29.1	11.8
Mean high water (MHW)	+28.3	11.0
Mean sea level (MSL)	+16.5	-0.8
Mean low water (MLW)	+2.3	-15.0
Mean lower low water (MLLW)	0.0	-17.3

Preliminary design criteria for the railroad includes a design speed of 50 miles per hour, a maximum grade of one percent, and a minimum horizontal curve of three degrees.

Alignment components discussed below are referenced to the key sheet shown in **Figure 6.2** *(Key Sheet Map).*

6.2.2 South Approach

The south approach for the Hybrid Alignment extends from the vicinity of 3rd Avenue in Anchorage northward to the POA. This segment is approximately 1.8 miles in length. For general alignment discussion purposes, the south approach consists of three basic sections: Section 1 extends from 3rd Avenue to the south end of the tunnel at Government Hill; Section 2 includes the tunnel at Government Hill; and Section 3 extends from the north end of the tunnel at Government Hill to the POA. Following is a brief discussion of the basic alignment components of the south approach.

Section 1

Section 1 extends from the existing Ingra-Gambell couplet at 3rd Avenue (STA 203+00) to the beginning of the tunnel at Government Hill (STA 248+00), approximately 0.85 mile in length. This section is shown in plan view on Sheet 1, **Figure 6.3**. This alignment segment begins with an extension of the Ingra-Gambell couplet northward across the former Alaska Native Hospital property to the vicinity of the south bluff of the Ship Creek Railyard. This couplet extension transitions into a merged section in the vicinity of STA 212+50 and is approximately 0.18 mile in length. The typical section for these one-way pair connections is shown in **Figure 6.4** *(Ship Creek Half-Bridge and Ingra-Gambell Connector Typical Section)*. From this point, a pier-supported viaduct begins and continues northward, spanning the Ship Creek Railyard with a minimum 50-foot vertical clearance, to approximately STA 238+00. This viaduct is approximately 0.48 mile in length, with assumed typical half-section as shown in **Figure 6.4**. Ramp connections may be added within this viaduct section during future engineering evaluations to provide rail yard access to support Ship Creek development plans and the POA.

Within the area from STA 238+00 to the beginning of the Government Hill tunnel section at STA 248+00, two alignment transitions occur. The primary alignment transition includes ramping transitions to the tunnel beneath Government Hill. A secondary transition includes the realignment of Loop Road and a ramp connection to the A/C Couplet.

Section 2

Section 2 of the south approach includes a tunnel alignment through Government Hill from approximately STA 248+00 to STA 255+00, approximately 700 feet in length. This section is shown in plan view on Sheet 1, **Figure 6.3**. This tunnel section aligns with Degan Street on Government Hill.

Section 3

Section 3 of the south approach extends from the north end of the tunnel at Government Hill, approximately STA 255+00, to the POA near STA 300+00. The length of Section 3 is approximately 0.85 mile and is shown in plan view on Sheets 1 and 2, **Figures 6.3 and 6.5**.

From the north end of the tunnel, the roadway alignment transitions from the two-level tunnel to a merged four-lane roadway that aligns with Terminal Road at the POA. The alignment then follows the east boundary of the POA and west boundary of Elmendorf AFB to the northern vicinity of the POA, near STA 300+00.

6.2.3 Crossing Segment

The crossing of the Knik Arm segment extends from approximately STA 300+00 on the east side of Knik Arm at the POA to the existing Point MacKenzie Access Road near STA 610+00 in the Mat-Su Borough, a distance of approximately 5.9 miles. From the POA, the roadway aligns along the east bluff of Knik Arm from approximately STA 300+00 to 1.7 miles north of Cairn Point, near STA 430+00. This approach section is approximately 2.5 miles in length. The typical roadway section is shown in **Figure 6.6** *(Toe of Bluff Section)*, and the alignment is shown in plan view on Sheets 2, 3, 4, 5, 6, and 7; **Figures 6.5, 6.7, 6.8, 6.9, 6.10, and 6.11**. The length of the actual crossing of Knik Arm is approximately 2.65 miles. Preliminary design components for both bridge and tunnel alternatives are discussed in Volume 2.

6.2.4 North Approach

The north approach for the Hybrid Alignment (Houston Connector) extends from the west end of the Knik Arm crossing to the Parks Highway in Houston, a distance of approximately 28.7 miles. The general alignment for this segment is shown in **Figure 6.12** *(North Approaches—Initial Two Lane/Ultimate Four Lanes)*. The Houston Connector includes a 400-foot wide controlled access right-of-way throughout this segment to provide adequate width for future inclusion of additional travel lanes, a path for nonmotorized vehicles or pedestrians, future utilities, frontage roads, future upgrading to full-grade separated interchanges, and buffer space to protect adjacent land uses from roadway noise and visual impact. The typical sections for this segment are shown in **Figure 6.12**, consisting of an interim two-lane roadway and ultimate four-lane, build-out, limited-access expressway facility. The North Approach consists of the Ayrshire Road Segment and the North Segment, as previously described.

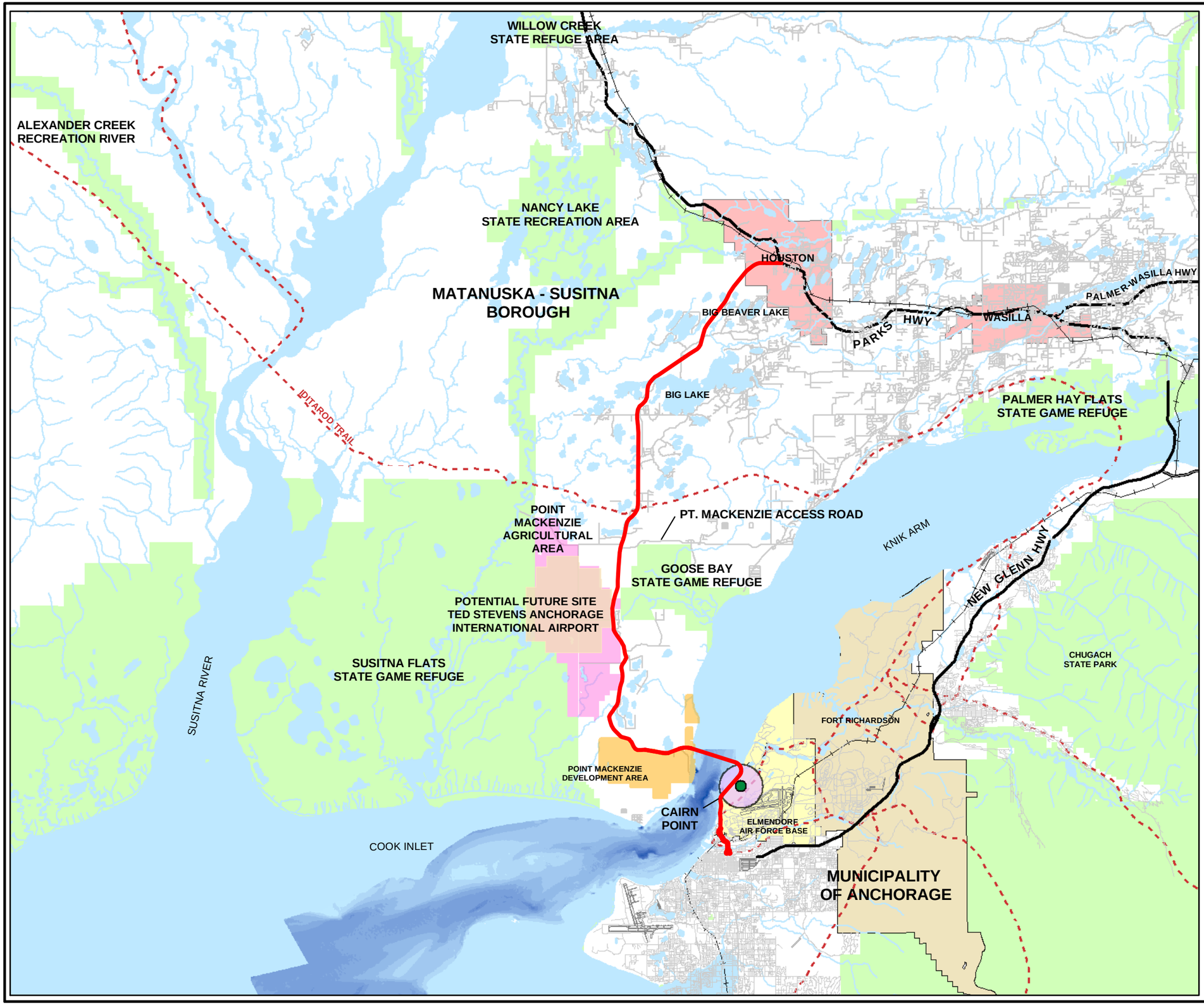
The alignment for the Ayrshire Road Segment includes an 11.7-mile, limited-access roadway from the Knik Arm crossing to the east-west segment of the Point MacKenzie Access Road. The alignment would follow the existing Point MacKenzie Access Road and includes five intersections: south of Lake Lorraine, south of Twin Island Lake, west of Lost Lake, Holstein Heights Subdivision (Point MacKenzie Agricultural Area), and the east-west segment of Point MacKenzie Access Road.

The North Segment consists of a 17-mile, limited-access roadway from the east-west segment of Point MacKenzie Access Road north to the Parks Highway at Houston. Proceeding north from the Ayrshire Road Segment, the alignment for the North Segment would pass between Carpenter Lake and Cann Lake; then it would proceed northeast, passing between Cann Lake and Jewell Lake for approximately 6.3 miles to South Big Lake Road. In the next 10.2 miles, the alignment would cross over the narrows between Mirror Lake and Big Lake, pass south of Bottle Lake and north of Orchid Lake, continue northeast between Blanket Lake and Little Beaver Lake, and then turn east and terminate at the Parks Highway approximately 0.25 mile south of the Alaska Railroad grade crossing in Houston. The North Segment includes six intersections: east of Jewell Lake, Irish Hills Subdivision, South Big Lake Road, Horseshoe Lake Road, west of Beaver Lakes, and the Parks Highway. The alignment also includes a 400-foot bridge at the narrows, between Big Lake and Mirror Lake (USCG vertical clearance not determined), and a grade-separation at the crossing of the Iditarod Trail. As mentioned previously, this alignment is

subject to change under future EIS evaluations and is only identified for purposes of estimating a representative cost for this roadway segment.

6.3 Route Alignment Update (Hybrid Alignment) Summary

The Hybrid Alignment, identified for cost-estimating purposes only, includes a Downtown/Bluff route beginning at the Ingra-Gambell couplet for the south approach, both a bridge and tunnel alternative for the crossing of Knik Arm, and a north approach in the Mat-Su Borough terminating at the Parks Highway in Houston. The total project length for the Hybrid Alignment is approximately 36.5 miles.



Knik Arm Crossing Engineering Feasibility and Cost Estimate Update

Hybrid Alignment Location Map

Figure 6.1

Legend

- Hybrid Alignment
- Elmendorf Antenna Location
- Trails
- Roads
- Railroad
- City Limits
- Refuges

Depth (meters)

- 0
- 1 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- 25 - 30
- 30 - 35
- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60

Data compiled by HDR Alaska, Inc.
September 2002

Source of data from:
Municipality of Anchorage,
Matanuska-Susitna Borough,
Department of Natural Resources,
USGS

Map is projected to Alaska Stateplane Zone 4, NAD 27.

3 1.5 0 3 Miles

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KEY SHEET MAP

KNIK ARM CROSSING
ENGINEERING FEASIBILITY STUDY
COST ESTIMATE UPDATE

FIGURE 6.2


A ST
C ST
ARRC MAINLINE
SHIP CREEK
WHITNEY ROAD
ARRC
LOOP ROAD
WEST BLUFF ROAD
TERMINAL ROAD
4TH AVE
3RD AVE
GAMBELL ST
INGRA ST
SHIP CREEK SECTION
TUNNEL SECTION
BEGIN ST
205+00
210+00
215+00
220+00
225+00
230+00
235+00
240+00
245+00
250+00
255+00
260+00
265+00
270+00
405+00
410+00
415+00
420+00
425+00
430+00
435+00
440+00
445+00
450+00
455+00
460+00
465+00
400
0
200
400
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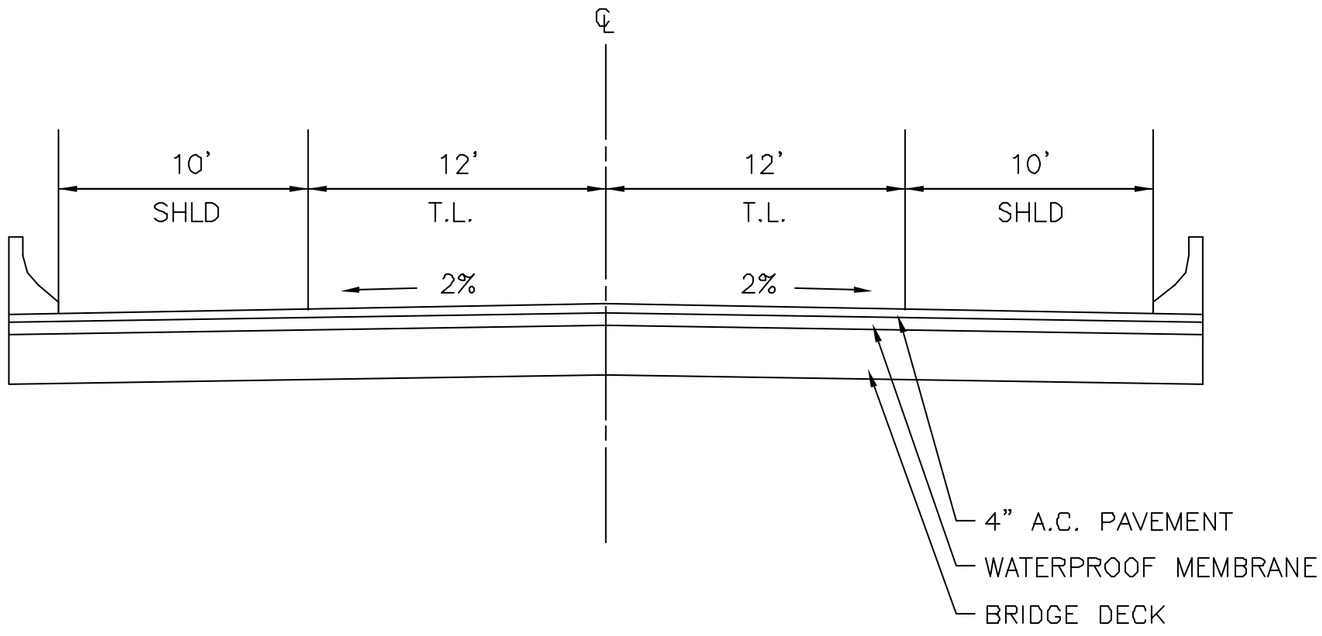
DEPARTMENT OF TRANSPORATION
AND
PUBLIC FACILITIES
KNIK ARM CROSSING
ENGINEERING FEASIBILITY AND
COST ESTIMATE UPDATE
SHEET 1
FIGURE 6.3



SHIP CREEK HALF–BRIDGE AND
INGRA–GAMBELL CONNECTOR TYPICAL SECTION

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KNIK ARM CROSSING
ENGINEERING FEASIBILITY AND COST ESTIMATE UPDATE

FIGURE 6.4

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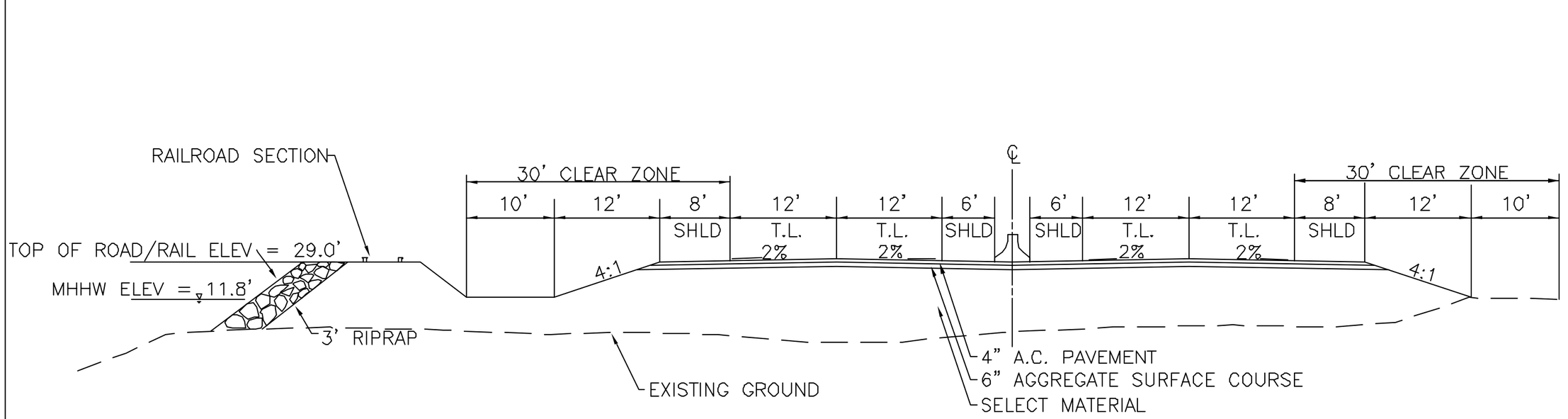
KNIK ARM CROSSING
ENGINEERING FEASIBILITY AND
COST ESTIMATE UPDATE
SHEET 2
FIGURE 6.5



ELEVATIONS SHOWN ARE BASED ON MOA DATUM

TOE OF BLUFF SECTION

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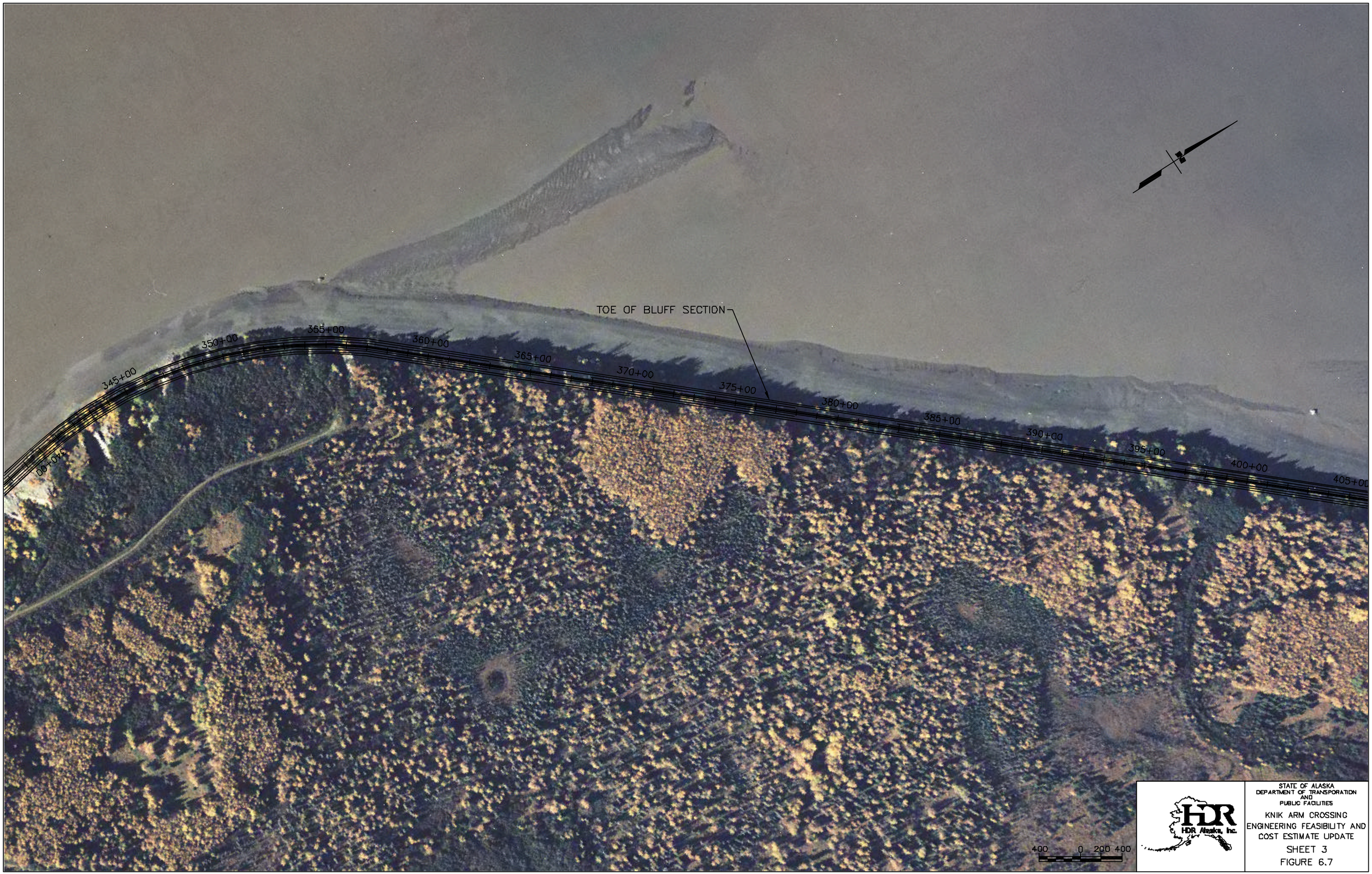
KNIK ARM CROSSING
ENGINEERING FEASIBILITY AND
COST ESTIMATE UPDATE

FIGURE 6.6



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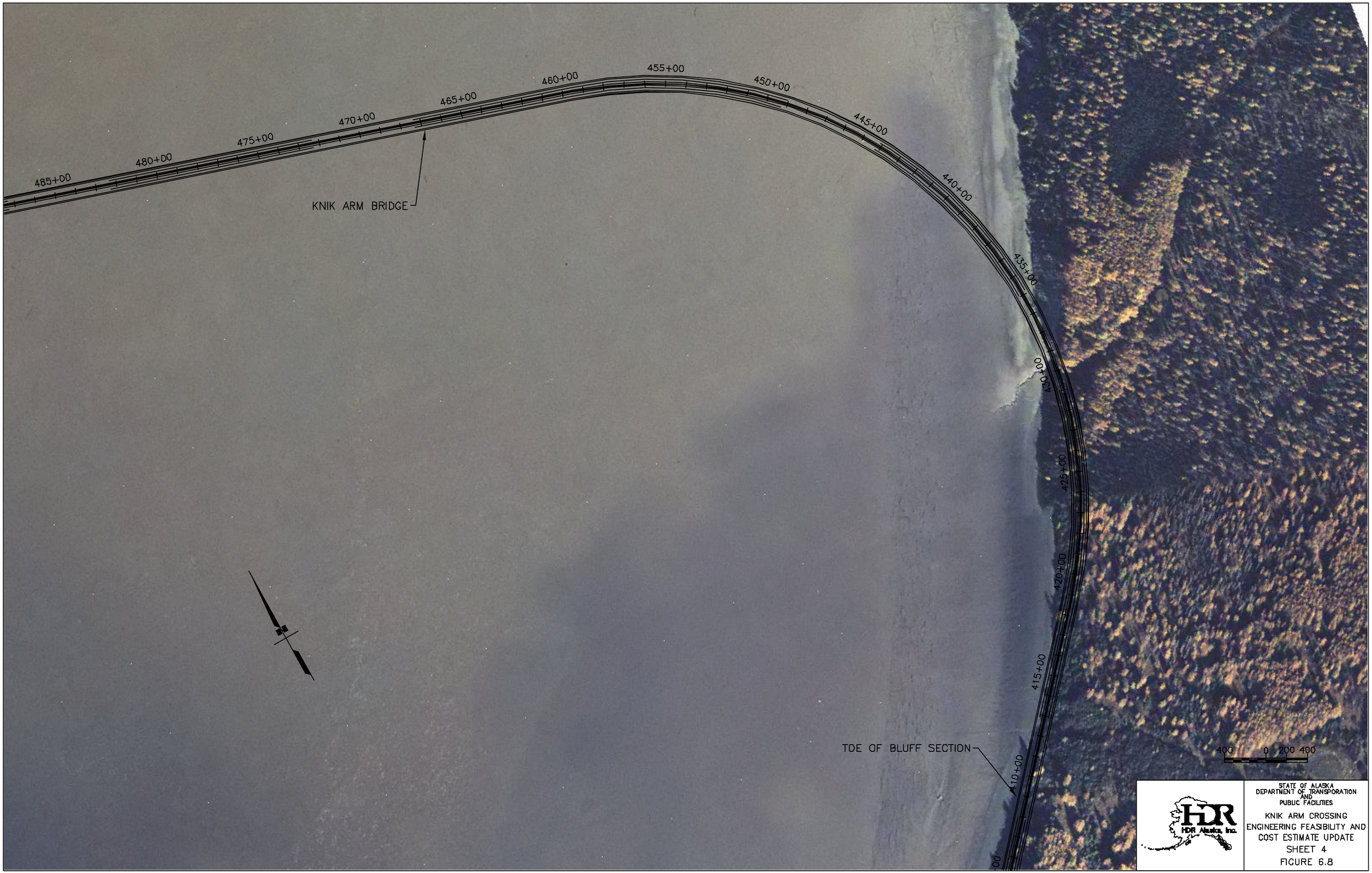
KNIK ARM CROSSING
ENGINEERING FEASIBILITY AND
COST ESTIMATE UPDATE

SHEET 3
FIGURE 6.7



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KNIK ARM CROSSING
ENGINEERING FEASIBILITY AND
COST ESTIMATE UPDATE
SHEET 4
FIGURE 6.8

KNIK ARM BRIDGE

545+00 540+00 535+00 530+00 525+00 520+00 515+00 510+00 505+00 500+00 495+00 490+00 485+00

400 0 200 400

HDR Alaska, Inc.

STATE OF ALASKA
DEPARTMENT OF TRANSPORATION
AND
PUBLIC FACILITIES

KNIK ARM CROSSING
ENGINEERING FEASIBILITY AND
COST ESTIMATE UPDATE

SHEET 5
FIGURE 6.9

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PUBLIC FACILITIES

KNIK ARM CROSSING
ENGINEERING FEASIBILITY AND
COST ESTIMATE UPDATE

SHEET 6
FIGURE 6.10

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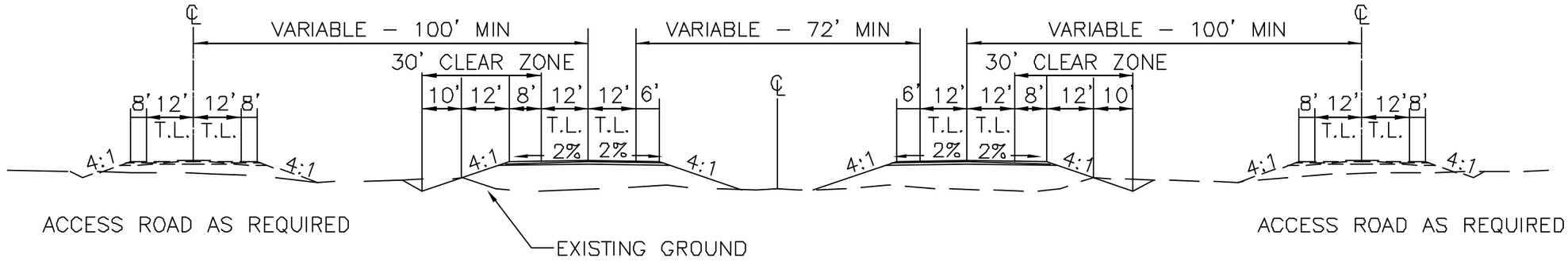
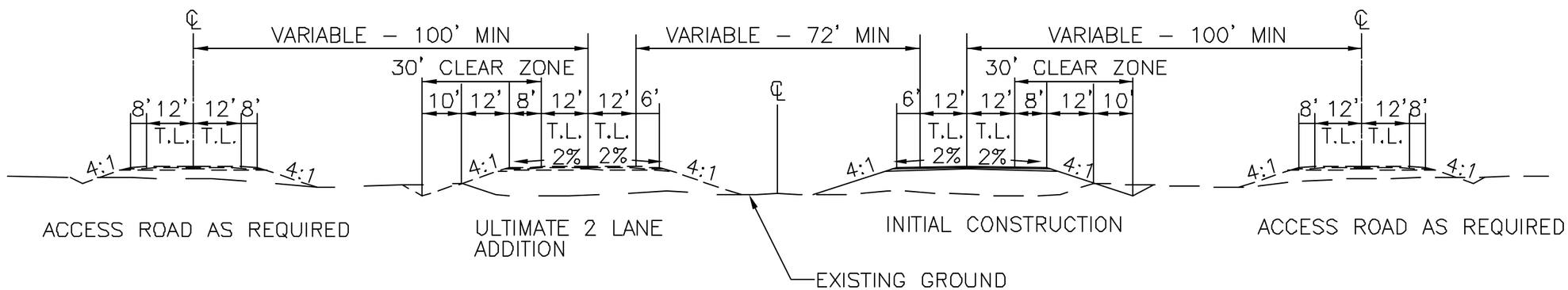
AND
PUBLIC FACILITIES

KNIK ARM CROSSING
ENGINEERING FEASIBILITY AND
COST ESTIMATE UPDATE

SHEET 7
FIGURE 6.11



NORTH APPROACHES
FOUR LANE CONSTRUCTION



NORTH APPROACHES
INITIAL TWO LANE/ULTIMATE FOUR LANES

HDR Alaska, Inc.

STATE OF ALASKA
DEPARTMENT OF TRANSPORATION AND PUBLIC FACILITIES

KNIK ARM CROSSING
ENGINEERING FEASIBILITY AND COST ESTIMATE UPDATE

FIGURE 6.12

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